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Environmental Protection Agency

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This report describes the procedures to be followed and analytical methods to be employed in developing an Air Quality Maintenance Plan (AQMP) for those areas that have been identified as having the potential of exceeding the National Ambient Air Quality Standards (NAAQS), because of present air quality or projected growth, over the 10-year period, 1975-1985. Procedures are described for projecting air quality through 1985, estimating associated air quality, and identifying and quantifying any potential air quality maintenance problem. Using this analysis as a base, procedures for developing alternative maintenance strategies and selecting a feasible strategy for the AQMA are presented. Methods of evaluating social and economic impact of maintenance strategies are included in the document. Content and format of an acceptable AQMP are included along with suggested intergovernmental cooperation arrangements and a suggested time schedule for development and submission of the AQMP by June 18, 1975 as required in 40 CFR 51.

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VOLUME 2:
PLAN PREPARATION

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Waste Management
Office of Air Quality Planning and Standards
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July 1974

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FOREWORD

This document is the second in a series comprising Guidelines for Air Quality Maintenance Planning and Analysis. The intent of the series is to provide State and local agencies with information and guidance for the preparation of Air Quality Maintenance Plans required under 40 CFR 51. The volumes in this series are:

Volume 1: Designation of Air Quality Maintenance Areas
Volume 2: Plan Preparation
Volume 3: Control Strategies
Volume 4: Land Use and Transportation Considerations
Volume 5: Case Studies in Plan Development
Volume 6: Overview of Air Quality Maintenance Area Analysis
Volume 7: Projecting County Emissions
Volume 8: Computer-Assisted Area Source Emissions Gridding Procedure
Volume 9: Evaluating Indirect Sources
Volume 10: Reviewing New Stationary Sources
Volume 11: Air Quality Monitoring and Data Analysis
Volume 12: Applying Atmospheric Simulation Models to Air Quality Maintenance Areas

Additional volumes may be issued.

All references to 40 CFR Part 51 in this document are to the regulations as amended through July 1974.

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Chapter I: INTRODUCTION

A. BACKGROUND

All States, pursuant to 40 CFR 51.12 (e), were required to identify areas that have the potential for exceeding any National Ambient Air Quality Standard (NAAQS) because of present air quality and/or projected growth over the 10-year period, 1975-1985. Such areas are called Air Quality Maintenance Areas (AQMA's), and may be identical with counties, urban areas, Standard Metropolitan Statistical Areas (SMSA's), or other boundaries. EPA is currently reviewing the information supplied by the States. The Administrator will issue an official list of the designated AQMA's in August 1974. For each designated area, States are to "submit a plan to prevent any national standards from being exceeded over the 10-year period from the date of plan submittal. Such plans shall include, as necessary, control strategy revisions and/or other measures to ensure that projected growth and development will be compatible with maintenance of the national standards throughout such 10-year period." States are further required to review the plan at 5-year intervals.

The plan for the maintenance of air quality for each pollutant in each AQMA will be a revision of the State Implementation Plan (SIP). Accordingly, the maintenance plan must specify precisely, and supply the rewording of, any parts, sections, or paragraphs of the SIP that require modification as a result of air quality maintenance activities.

Once designated, an AQMA must be analyzed in detail and the analysis must be presented in the 10-year Air Quality Maintenance Plan (AQMP). If the analysis demonstrates that, in fact, the area is not a potential problem, EPA will consider deleting the area from the AQMA listing during the review and approval process. Separate maintenance strategies must be developed and included in the AQMP for each designated pollutant in each of the designated AQMA's for which analysis indicates that a problem will exist during the 1975-1985 period.

B. INTRODUCTION

Inherent in the development of the AQMP is the assumption that NAAQS will be attained by 1975 (or up to 1977 with an extension). The control strategies for attainment were developed as part of the SIP's in 1971 using 1969 or 1970 air quality and emissions data. AQMP's will be developed using updated air quality and emissions data. Projection of ambient air quality using more recent data might confirm the expected attainment of the NAAQS as scheduled. There is always the possibility, however, that such projections will indicate possible non-attainment, especially for particulate matter and oxidants. Should analysis of existing and projected air quality and emissions data indicate this to be the case, States should submit a combined attainment/maintenance plan. The maintenance or attainment/maintenance plan should be submitted and incorporate control strategies designed to provide the emission reductions required to maintain or to attain and maintain the NAAQS. The control strategies in either case are designed to control or accomodate existing emissions and the emissions that would result from growth and development within the AQMA through 1985.

For the sake of simplicity, in this document the term "Air Quality Maintenance Plan (AQMP)" will be used to describe the plan to be submitted by the appropriate States in June 1975, whether it is an attainment/maintenance plan or only a maintenance plan.

Analysis of the air quality situation in an AQMA can disclose several possibilities for attainment and maintenance of the NAAQS. The most probable ones are shown schematically in figure I-1.

1. Case A represents the situation wherein the SIP attainment strategy will result in emissions sufficiently below those required to attain NAAQS and to accomodate growth through 1985. Neither a maintenance plan nor a revised attainment plan is required.

2. Case B represents a situation wherein the SIP attainment strategy will result in attainment of the NAAQS by the required time but in which growth and development will cause the NAAQS to be violated within 1975-1985. A maintenance plan only is required in this situation.

3. Case C represents a situation wherein the NAAQS will not be attained. The situation is further compounded by the increased emissions

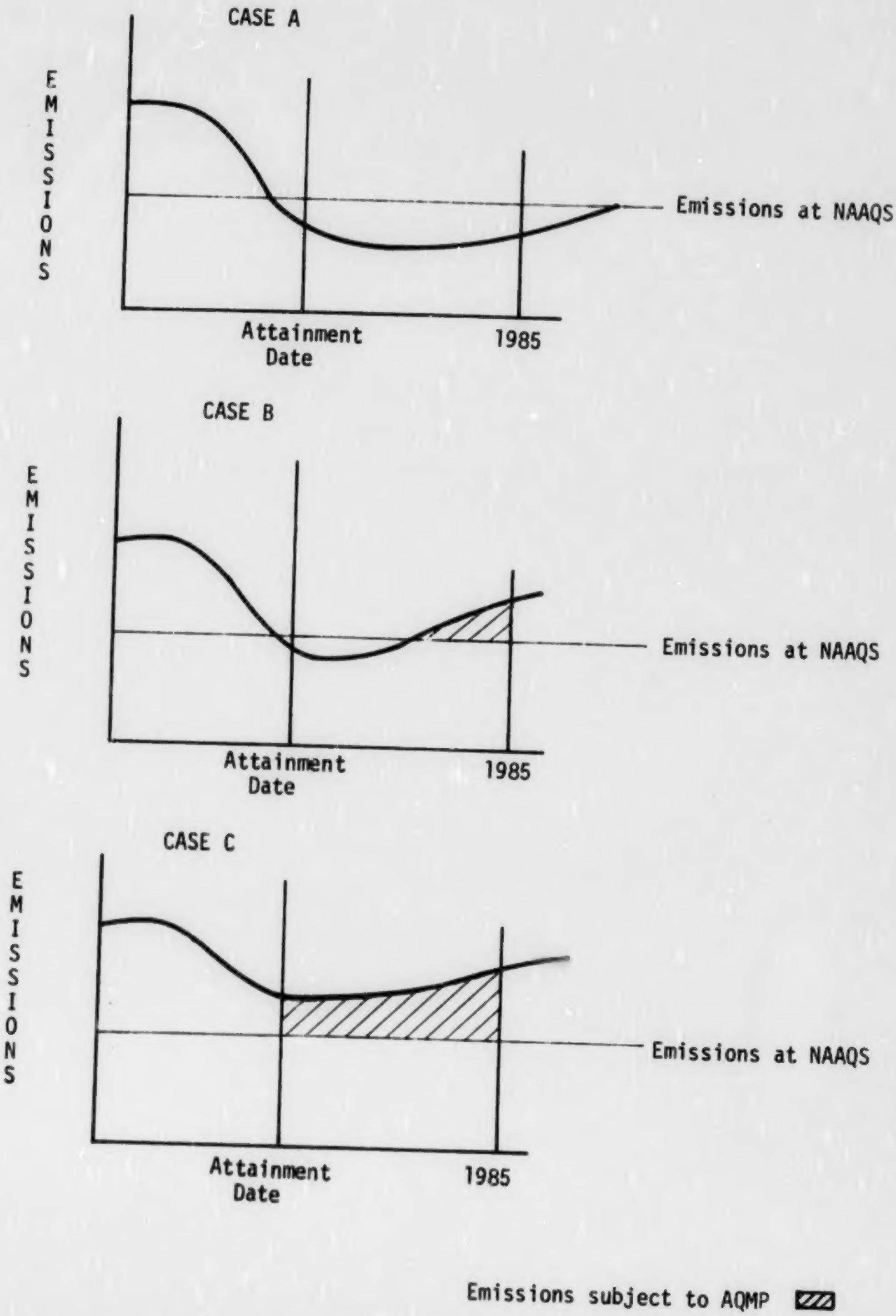

Figure I-1. Potential Compliance Schedules

that will result from growth and development. An attainment/maintenance plan is required in this situation.

This document provides information and guidance to the States for the preparation of AQMP's. The general requirements for preparation are discussed in the sections that follow in this chapter.

C. PLAN PREPARATION

1. Time Schedule

A time schedule for the overall process of preparing AQMP's is shown in figure I-2.

2. Plan Preparation Sequence

The steps required in the detailed analysis of a potential problem area and, where necessary, the preparation of a plan to provide for the maintenance of air quality are shown in flow chart form in figure I-3. Upon publication of a list of AQMA's in the Federal Register and the issue of guidelines for preparation and implementation of the 10-year plan, the States should undertake the following tasks.

a. Intergovernmental Cooperation. The following subtasks are required. These are described in Chapter II of this document.

1) Establish a basis for intergovernmental cooperation.
2) Delineate roles and missions of State and local agencies.

b. Review of Existing Data and Resources. The following subtasks are required. These are discussed in chapter III.

1) Review SIP, emissions inventories, air quality data, and other plans.
2) Determine adequacy of emissions and air quality data.

c. AQMA Analysis. This major task is essentially a refinement of the rough cut analysis upon which initial recommendation of areas to be designated as AQMS's was made. Using refined growth factor and development patterns, the designated AQMA's are subjected to a more detailed analysis to identify specific areas within the AQMA where air quality problems will exist through 1985 and to quantify these problems. Output of this analysis forms the basis for the development and selection of the maintenance strategies that will become a part of the AQMP. Following are

1974	A	EPA PUBLISHES FINAL LIST OF AQMA'S EPA ISSUES PLAN DEVELOPMENT GUIDELINES TO STATES; PROPOSES REGULATIONS ON SAME IN FEDERAL REGISTER; BRIEFS REGIONAL OFFICES ON GUIDELINES
	S	EPA PUBLISHES FINAL REGULATIONS ON PLAN DEVELOPMENT IN FEDERAL REGISTER
	O	
	N	
	D	
1975	J	
	F	STATES COMPLETE DRAFT OF AQMP'S
	M	
	A	STATES ANNOUNCE HEARINGS; MAKE DRAFT AQMP'S AVAILABLE
	M	STATES HOLD PUBLIC HEARINGS STATES REVISE AQMP'S, AS NECESSARY, BASED ON PUBLIC HEARINGS
	J	STATES SUBMIT AQMP'S TO EPA EPA STARTS PREPARING AQMP'S FOR STATES THAT DID NOT SUBMIT PLANS OR SUBMITTED INADEQUATE AQMP'S
	J	
	A	
	S	EPA PUBLISHES PROPOSED APPROVAL/DISAPPROVAL ACTION ON AQMP'S
	O	EPA APPROVES/DISAPPROVES AQMP'S; PROPOSES AQMP'S FOR STATES THAT DID NOT SUBMIT ADEQUATE AQMP'S EPA ANNOUNCES HEARINGS ON PLANS FOR STATES THAT DID NOT SUBMIT AQMP'S OR SUBMITTED INADEQUATE AQMP'S
	N	EPA HOLDS PUBLIC HEARINGS ON PLANS DEVELOPED FOR STATES THAT DID NOT SUBMIT AQMP'S OR SUBMITTED INADEQUATE AQMP'S
	D	EPA PROMULGATES AQMP'S FOR STATES THAT DID NOT SUBMIT AQMP'S OR SUBMITTED INADEQUATE AQMP'S

Figure I-2. Schedule of the AQMP process of AQMP's.

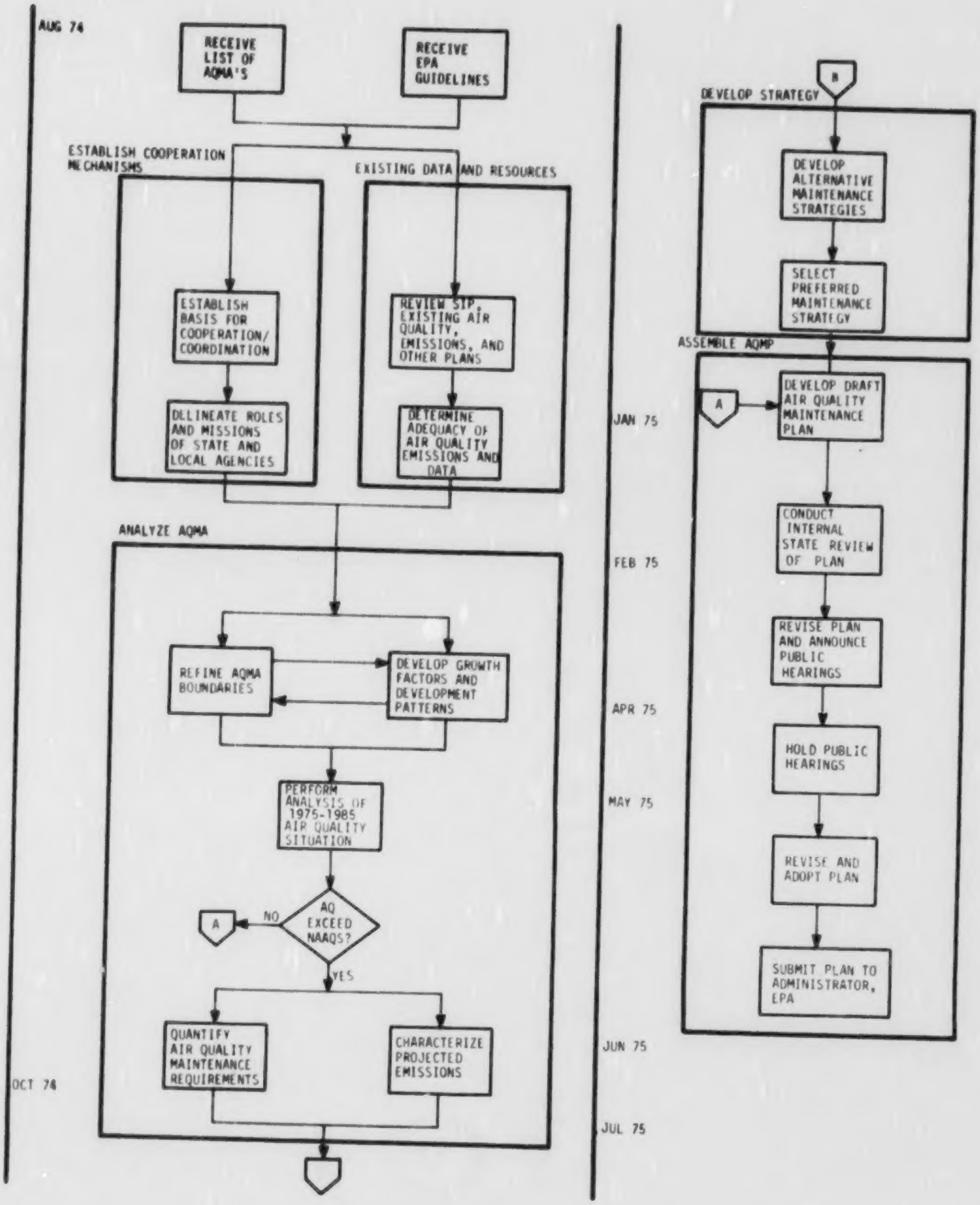
AUG 74
RECEIVE LIST OF AQMA'S
RECEIVE EPA GUIDELINES
ESTABLISH COOPERATION MECHANISMS
EXISTING DATA AND RESOURCES
ESTABLISH BASIS FOR COOPERATION/ COORDINATION
REVIEW SIP, EXISTING AIR QUALITY, EMISSIONS, AND OTHER PLANS
DELINEATE ROLES AND MISSIONS OF STATE AND LOCAL AGENCIES
DETERMINE ADEQUACY OF AIR QUALITY EMISSIONS AND DATA
ANALYZE AQMA
REFINE AQMA BOUNDARIES
DEVELOP GROWTH FACTORS AND DEVELOPMENT PATTERNS
PERFORM ANALYSIS OF 1975-1985 AIR QUALITY SITUATION
AQ EXCEED NAAQS?
NO
YES
A
QUANTIFY AIR QUALITY MAINTENANCE REQUIREMENTS
CHARACTERIZE PROJECTED EMISSIONS
OCT 74
JAN 75
FEB 75
APR 75
MAY 75
JUN 75
JUL 75
B
DEVELOP STRATEGY
DEVELOP ALTERNATIVE MAINTENANCE STRATEGIES
SELECT PREFERRED MAINTENANCE STRATEGY
ASSEMBLE AQMP
A
DEVELOP DRAFT AIR QUALITY MAINTENANCE PLAN
CONDUCT INTERNAL STATE REVIEW OF PLAN
REVISE PLAN AND ANNOUNCE PUBLIC HEARINGS
HOLD PUBLIC HEARINGS
REVISE AND ADOPT PLAN
SUBMIT PLAN TO ADMINISTRATOR, EPA

Figure I-3. States' action sequence for air quality maintenance planning.

the subtasks required for this analysis. These subtasks are described in chapter IV.

1) Develop growth and development patterns.
2) Refine AQMA boundaries.
3) Perform analysis of 1985 air quality situation.
4) Quantify air quality maintenance requirements.
5) Characterize projected emissions.

EPA will establish procedures for early revision of AQMA boundaries, including deletion of areas from the AQMA list, if the need develops.

d. Maintenance Strategy Development. Using the quantificatior and characterization of emissions as a base, alternate maintenance strategies are developed and evaluated to derive the strategy most suited to the AQMA. A strategy is required for each pollutant for which the AQMA has been designated. The strategy may apply to the entire AQMA, as in the case of hydrocarbon and nitrogen oxide controls, or to selected portions for particulates, sulfur oxides, and carbon monoxide. The following subtasks, described in detail in chapter V, comprise this task.

1) Develop alternative maintenance strategies.
2) Select preferred maintenance strategy based on economic and social acceptability evaluations.

e. AQMP Preparation and Assembly. Upon the selection of the maintenance strategy, the AQMP is prepared and internally reviewed within the State. The procedures, described in detail in chapter VI, consist of the following steps.

1) Develop draft AQMP.
2) Conduct internal State review of AQMP.
3) Revise AQMP and announce public hearings.
4) Hold public hearings.
5) Revise and adopt AQMP.
6) Submit AQMP to EPA Administrator.

3. Plan Revision and Review

Two review procedures are required at 5-year intervals: 1) reassessment of area designation to determine if additional areas should be designated as AQMA's or if areas currently designated as

AQMA's should be deleted, and 2) reanalysis of the impact of growth on air quality and the control strategies and/or other measures adopted to ensure that projected growth and development will be compatible with maintenance of NAAQS.

Procedures for reanalysis of the AQMP are contained in Guidelines for Air Quality Maintenance Planning and Analysis, vol. 6, Overview of Air Quality Maintenance Area Analysis. The reanalysis will be made on each AQMA designated by the Administrator, EPA. The impact of projected growth and development on air quality, and the control strategy and/or other measures developed to ensure attainment and maintenance of the NAAQS will be included in the 5-year review. This reassessment process also can be used to validate the models used to estimate the air quality during the development of the AQMP. As with the initial designation of AQMA's, public hearings are required prior to submission of the plan revision.

D. SOURCE DOCUMENTS

Source documents required for the analysis and development of the AQMP are contained in the Guidelines for Air Quality Maintenance Planning and Analysis. This series currently consists of 12 volumes with additional volumes to be added as necessary. For example, work is progressing in developing a volume that will describe a methodology for projecting and allocating projected emissions on a subcounty basis. A brief description of the volumes in this guidelines series and anticipated publication dates follow.

1. Vol. 1. Designation of Air Quality Maintenance Areas

This document was originally published in January 1974 as Guidelines for Designation of Air Quality Maintenance Areas, OAQPS 1.2-016. A description of the requirements and procedures for recommending areas to be designated as AQMA's is contained in this volume.

2. Vol. 2. Plan Preparation (This document)
3. Vol. 3. Control Strategies

This volume, published concurrently with vol. 2, describes the various maintenance measures that may be used as part of the maintenance strategy. The listing of measures is not exhaustive but does provide those measures that appear to have broad application to all States. States are encouraged to develop additional measures that may be required for the air quality maintenance problems that may be peculiar to their areas of responsibilities.

4. Vol. 4. Land Use and Transportation Considerations

This volume describes the relationships of air quality maintenance and comprehensive planning. Land use and transportation considerations for the air quality maintenance planner are also presented.

5. Vol. 5. Case Studies in Plan Development

This volume describes the experiences of four contractors in the development of AQMP's in Denver, San Diego, St. Louis, and Baltimore. Problems and solutions are included along with examples of portions of potential plans.

6. Vol. 6. Overview of Air Quality Maintenance Area Analysis

This document presents an overview of the specific guideline documents described in paragraphs 7 through 12 below. The document discusses ways to enhance the analytical capabilities of local agencies, the role of analysis in AQMP development, and the advantages of including provisions for augmenting analytical capabilities in an AQMA.

7. Vol. 7. Projecting County Emissions

This volume describes three levels of analysis:

a. Use of Federal and State data only--the least accurate but the most expeditious level. This approach is to be used only after prior consultation with the appropriate Regional Office.

b. Use of locally available data to supplement or replace Federal and State data. Special studies and locally conducted studies, e.g., transportation and land-use plans, may be used for this purpose.

c. Use of data developed through extensive local contacts and interviews to supplement or replace data obtained using the first two levels of analysis.

The analysis is applied in a three-step procedure to project emissions on a countywide basis. Step 1 is the determination of base period emissions through a systematized routine updating procedure of NEDS and other emission data; step 2 is a projection of economic and demographic growth; and step 3 an estimation and projection of relationships between economic/demographic parameters and emissions.

8. Vol. 8. Computer-Assisted Area Source Emissions Gridding Procedure (CAASE)

This document is a user's manual for a computerized technique that apportions area source emissions within a county. The apportionment is based on population data from U.S. Census Bureau tapes. An override capability exists so that it is possible for the local agency to apportion future emissions on the basis of land use, transportation plans, or other information. Possible relationships among land use, population, and emissions that could be used as bases for override factors are enumerated. The program, documented for use on the UNIVAC computer, will be available to EPA Regional Offices on a time-sharing basis. Versions that are appropriate for IBM computers are also available. State and local agencies can obtain copies through the Regional Offices.

9. Vol. 9. Evaluating Indirect Sources

This volume presents a simple methodology for estimating CO concentrations in the vicinity of indirect sources. The following indirect sources are included: highways, airports, regional shopping centers, sports complexes, municipal parking lots, amusement parks, and recreational areas. More detailed methodologies for estimating emissions from indirect sources and the resulting impact on air quality are presented in appendixes.

10. Vol. 10. Reviewing New Stationary Sources

This document describes methods for estimating the impact of point sources on ground-level concentrations of stable pollutants after certain design parameters are identified and the source's location is known. Concentrations estimated using these guidelines would be superimposed over the general background concentrations (estimated with mesoscale models) to determine whether the proposed new source is likely to result in an unacceptable threat to air quality standards.

11. Vol. 11. Air Quality Monitoring and Data Analysis

This volume will contain information selective to air quality maintenance in the following eight topical areas:

a. Air quality monitoring network design and instrument siting: design of air quality networks, siting of instruments, and probe location criteria.

b. Acceptable air quality methods: discussion of approved methods for monitoring "criteria" pollutants, listing of unacceptable methods, and those that are unapproved pending equivalency testing.

c. Monitoring site description: informational items concerning monitoring sites that could be useful in interpreting air quality data.

d. Procedures for flow and auditing of air quality data: data flow, validation and verification, and steps to follow to evaluate suspect air quality data.

e. Air quality trends evaluation: provides methodologies and statistical techniques for evaluating historical air quality trends.

f. Air quality data evaluation: provides methodologies for summarizing air quality data such as averages, means, frequency distribution, etc. and how to assess the extent and magnitude of the air quality in a particular AQCR or geographical area.

g. Interpretation of air quality data as it relates to NAAQS: discusses issues and presents recommendations concerning violation of NAAQS, definition of terms such as year, day, running, averages, and the use of extrapolation techniques.

h. Establishment of baseline air quality levels: discussion of the quantity, type, and areal and temporal distribution of air quality data necessary for determination of baseline air quality for a geographical area.

12. Vol. 12. Applying Atmospheric Simulation Models to Air Quality Maintenance Areas

In this volume models that are accessable to EPA and that are suitable for estimating representative concentrations over spatial scales ranging from approximately 1 km^2 to citywide averages are discussed. The document covers the applicability of both calibrated and uncalibrated models. The models are listed in ascending order of the complexity (as determined by data requirements). The name, developer, availability, data requirements, appropriate pollutants, sampling times, and spatial scales are given. The purpose is to indicate examples of models that can be used for various applications and to illustrate the greater flexibility afforded with the acquisition of a more complete data set. Models in this volume include modified rollback, Miller-Holzworth, Hanna-Gifford, HIWAY, APRAC, AQDM/CDM, short-term models such as GEOMET, and SAI photochemical.

Chapter II: INTERGOVERNMENTAL COOPERATION

A. INTRODUCTION

In some AQMA's, the present and future air quality and the community growth situation are such that the maintenance element to be added to the SIP will consist of relatively simple additional measures or modifications to existing measures for minimizing emission of pollutants from new and existing sources. In other areas, principally in major urban centers, the additions and modifications to the SIP to provide for long-term maintenance of air quality standards may be quite extensive, involve relatively new and innovative approaches, and incorporate provisions that are closely associated with land-use and transportation planning and controls. In either situation, it is prudent to ensure that the objectives and plans for air quality control are substantially consistent with other community objectives and plans. In the more difficult situations, however, because of the strong relationships to overall community growth and development, it is essential to the ultimate effectiveness of the AQMP that various community goals and plans and all appropriate governmental entities are considered and involved at all stages of development and implementation of the AQMP. In addition, early public involvement and participation are essential for the generation of public awareness and support. This chapter is intended to assist State and local governments in the identification of the relationships between the AQMP and other community goals, plans, and activities, and to suggest ways that the AQMP and its development and implementation can be integrated into and coordinated with overall community plans, goals, activities, and institutional arrangements. Two main tasks are involved: 1) establishment of the basis for cooperation and coordination, and 2) delineation of the missions for State and sub-State agencies and groups.

B. BASIS FOR COOPERATION AND COORDINATION

Each state must choose a structural framework for execution of the AQMP process. Operations in the air quality maintenance planning and implementation process may involve governmental entities at the State, regional, and local levels. At these levels, a variety of special-purpose agencies, including those concerned with air pollution control, building regulation, transportation, water supply and pollution control, solid waste collection and disposal, and zoning, as well as those that engage in broader activities, such as comprehensive community planning agencies and Councils of Governments (COG's) may be involved. Environmental, land-use, and transportation programs are summarized in appendix A. The governor of each State, who is ultimately responsible for the AQMP, should ensure that appropriate arrangements are made to involve and utilize these various agencies and to ensure both cooperation and coordination. The State agency with the leading responsibility for doing so, under direction of the Governor, is usually the State air pollution control agency. However, many other agencies may have very significant roles, and a variety of institutional arrangements may be utilized. Provision must be made for input and review of maintenance plans by interested citizens and public representatives. Particular attention must be given to providing that the AQMP balances community goals and has mechanisms for resolving conflicting ones.

The AQMP focuses on the long-term maintenance of air quality rather than the attainment of NAAQS by a specific date as does the SIP. Maintenance is a continuing evaluation, planning, and implementation process. Even though the initial AQMP, due to the short time for preparation, may utilize increased use of straightforward emission reduction strategies, the State must begin to identify the agencies and coordination frameworks for long-range air quality maintenance. These agencies and coordination procedures must provide the basis for any needed changes of the initial AQMP.

Due to the long-term focus of the AQMP, the timing of a particular maintenance strategy is crucial. The point in time at which a particular strategy must be implemented is linked to the industrial growth and urban development of an AQCR. This fact alone makes for effective and continuing cooperation between air pollution control and land-use and development planning groups.

Success of the AQMP process is dependent upon effective coordination and integration of various functional bodies at different levels of government. This process involves the coordination of transportation, land-use, environmental, and all other considerations that impact on planning and growth. Air quality considerations must be successfully integrated into both the planning and decisionmaking procedures of the parties responsible in all of the above areas. Likewise, authorities responsible for land-use, transportation, and other environmental functions must be integrated into the AQMP process in order to ensure that all plans are consistent and that the AQMP can be implemented successfully. In addition, the maintenance planning process must be iterative in terms of information feedback and interaction of various interests and periodic review and updating. Formal reevaluation at least once each 5 years is a requirement. Because allowable new emissions may be constraining, they will have a significant impact on the options a community has for development.

C. EXISTING COORDINATION FRAMEWORKS

To effectively coordinate air quality maintenance activities with other enviornmental protection and comprehensive planning activities, coordination on the regional to city scale is essential. "Regional" does not have the meaning of a specified area of land. Rather it is used to refer to an area that includes several municipalities, several special purpose districts, and in many cases, several counties. It is necessary to focus on the regional scale because air quality is inherently an areawide problem that transcends city/county political boundaries. The regional scale also bridges the functional activities of planning and implementation activities that traditionally have been separated. Although efforts at regional planning have continued to increase, city/county jurisdictions have generally retained the land-use control authority necessary for plan implementation--building and zoning regulations, taxation, and public services.

A basic problem in coordination is the traditional separation of land-use planning and environmental protection activities at all levels of government. Any coordination framework in which implementation of air quality plans is to be effective must give due consideration to the prevalent attitude of local governments that land-use controls are their prerogative. A corollary to this is the recognition that air quality, land-use, and transportation objectives, viewed from the local perspective, must be reconciled with many other land-use and transporation objectives and goals.

Time constraints on the preparation and submission of AQMP's preclude, for the most part, significant local agency reorganization. Emphasis, therefore, will be on the provision of guidance for the use of existing regional organizational and cooperative arrangements and agencies to obtain effective coordination of air quality maintenance and other environmental activities. Although existing institutions should be used to initiate air quality maintenance planning and implementation, others that may be more effective in the longer timeframe should be developed as part of the continuing air quality maintenance.

1. Coordination Devices

Several mechanisms that are aimed at promoting planning and coordination at the regional/city level are in existence. These are the Department of Housing and Urban Development's section 701 program, A-95 review, and Environmental Impact Statement (EIS) preparation and review.

a. 701 Planning. Substantial Federal support for metropolitan and areawide planning began with the passage of the 1954 Housing Act. Under section 701 of this act, financial assistance was provided to encourage metropolitan planning. At first section 701 was aimed at municipal planning. The Housing Act of 1959 increased its impact on regional planning and substituted "comprehensive" planning for "urban" planning. This act also required that federally assisted planning cover entire urban areas with related developmental problems. Various arrangements, from city-county and regional agencies to informal cooperative agreements between local jurisdictions have been made to meet section 701 grant requirements (ref. 1). However, planning under the section 701 program is generally done within a COG or Regional Planning Commission (RPC) framework.

As a condition for urban renewal assistance, a workable program is required for community development including long-range general plans of land-use, transportation, and public facilities. This was a boost to the regional perspective in some areas. Physical planning and capital improvements are the main elements stressed in section 701 planning.

b. A-95 Review. The Office of Management and Budget Circular No. A-95 sets up the structure for implementing sections of three acts: Title IV of the Intergovernmental Cooperation Act of 1968, section 204 of the Demonstration Cities and Metropolitan Development Policy Act of 1966, and section 102(2)(c) of NEPA. The significance of the A-95 review process is that it provides a structure for multifunctional planning by strengthening the communication among agencies and different governmental levels. This review process has wide applicability because State, regional, and metropolitan clearinghouses that administer the review and comment process have been widely established. The A-95 process is a step toward regional comprehensive planning.

Because intergovernmental cooperation is very important to the success of an air quality maintenance program, AQMP's must be processed through the A-95 review system. Time constraints on the preparation of the AQMP dictate that internal State review and coordination prior to formal adoption be accomplished as expeditiously as possible. Early involvement of the agencies participating in the clearinghouse review process during the development of the AQMP will ensure early identification and resolution of problems areas prior to processing the AQMP for formal A-95 review.

Circular A-95 has four basic parts, dealing with State and areawide review of Federal aid applications to avoid conflicting programs (Part I), Federal agency consultation with State and local governments prior to undertaking direct Federal development projects (Part II), gubernatorial review of federally required State functional plans before submission for Federal funding (Part III), and coordination of federally supported planning programs at the sub-state regional level (Part IV). Parts I and IV are especially germane to the task of implementing cooperation between land-use planning and air quality management.

1) Part I. Project Notification and Review System (PNRS), established under Part I of A-95, designates State and regional/metropolitan planning agencies as clearinghouses. Every State has established a State clearinghouse, and a majority have designated regional clearinghouses that in many cases are the regional COG's. Section 204 of the Demonstration Cities and Metroplitan Development Policy Act requires metropolitan clearinghouses. It is the responsibility of the clearinghouses to identify appropriate State and local environmental agencies and to make them aware of a proposed project for which a Federal grant is being requested and on which they should have an input. With respect to section 102 of NEPA, the clearinghouses are the channels through which agencies sponsoring a project receive State and local comments on its environmental impact.

The A-95 clearinghouses are a mixed lot reflecting the status of regional planning. As an indication of the mixture and the range of abilities, the initial group of clearinghouses (October 1967) consisted of 33 COG's, 59 multicounty RPC's, 72 single county or city/county planning agencies, three general-purpose county governments, and 20 State planning agencies (ref. 2).

Applicants for Federal grants must notify State and regional or metropolitan clearinghouses of their intent to apply and must provide a brief project description. The clearinghouse may or may not comment on the proposed project. However, in the case of environmental impact review, it is the responsibility of the clearinghouse to identify and notify State or local environmental agencies of the proposed project. Several specific areas are defined in which comments can be made. These include appropriate land-use, wise development and conservation of natural resources, balanced transportation systems, and environmental impact.

PNRS focuses on coordination at the beginning of the project application process. It thus provides the potential for revising projects before viewpoints and positions have solidified. Another value of PNRS is that after the development of an AQMP it continues to provide information on new projects. To the extent that these projects influence development, PNRS provides intelligence on emerging growth patterns.

2) Part IV. Part IV of A-95 requires coordination of federally supported planning programs at the regional level. Utilization of an A-95 agency for areawide planning instead of separate regional agencies improves coordination of different plans and more efficient integration of them into a consistent regional comprehensive plan. In seeking Federal grants, general-purpose planning agencies are given preference over single-purpose agencies.

c. EIS's. Section 102(2)(c) of the National Environmental Policy Act (NEPA) of 1969 requires EIS's to be filed with the Council on Environmental Quality (CEQ) by Federal agencies proposing major projects. The EIS's must consider the impact of the project on the environment; consider and describe alternatives to the proposal and their impacts; obtain comments from Federal, State, and local agencies; and make public the environmental analysis and agency comments. The relationship of the proposed action to land-use plans, policies, and controls in the project area and how conflicts with Federal, State, and local land-use have been resolved must be discussed.

An EIS is generally not required for private developments that do not receive Federal funding. However, some State laws require EIS's on private as well as on public and publicly funded development. Twelve States and Puerto Rico have adopted broad requirements for EIS's on State actions. Broad EIS's have been under consideration in another 21 States and the District of Columbia (ref. 3).

State EIS requirements are, for the most part, modeled on section 102(2)(c) of NEPA. However, significant differences exist from State to State. Some apply EIS's to local, as well as to State agencies; some require EIS's for private actions for which a government permit is required. Most States appear to limit EIS's to "agencies of the State," without clearly indicating which agencies or levels of government. The applicability of EIS's to private activities is also unclear in most States having EIS requirements. A major problem with State EIS's is that little provision has been made to enforce the EIS requirements. Different State agencies have been given coordination responsibility but not authority to ensure compliance by other agencies. Federally required EIS's are coordinated through the appropriate State, regional, or metropolitan A-95 clearinghouses.

Ideally, the preparation and review of an EIS is designed to provide the following:

- Consideration of the possible adverse effects on a project or activity.
- Consideration of alternatives to the project or activity and their adverse environmental effects.
- Review of and comment on the project or activity by all interested agencies, governmental bodies, and the public.

EIS's have several limitations as planning and implementation mechanisms for air quality maintenance activities:

- EIS review comments are in most cases advisory in nature and do not require alteration or abandonment of a proposed project or activity even though it may have an adverse environmental impact.
- EIS review by the air quality maintenance agency occurs late in the planning process.
- EIS requirements may not cover many projects and activities.
- EIS's vary widely in quality. Related to this is the fact that most EIS's may be too general to provide useful information to the air quality maintenance agency. The necessary spatial and temporal details of growth are often totally lacking.

2. Coordination Agencies

COG's and RPC's represent an approach by city governments to regional problems. It is basically a regional confederal approach (ref. 1) to promote common interests among a numer of governments without subordinating their individual powers or autonomy. Although COG's and RPC's are often used synonymously in the literature, this is not strictly correct.

a. RPC's. RPC's are metropolitan, regional, or areawide planning agencies composed of members appointed by the State or the local area involved. They are primarily responsible for multifunctional planning with a traditional influence on land-use planning and the coordination of local plans. RPC's are basically of three forms--county planning commissions, economic development district agencies, and hybrid organizations with special characteristics not generally associated with RPC's. The Twin Cities Metropolitan Council of Minnesota is an example of the hybrid RPC.

b. COG's. COG's are regional associations of local governments. They are an organizational device for continuing discussions of common problems, information exchange, and development of consensus policies. COG's have no authority to compel participation. Their existence rests on the good will of the constituent local governments (ref. 1). Some COG's are based on State legislation authorizing inter-local planning; others on a specific enabling act; and others on no formal or implied State permissive action.

c. Other. Other agencies have been established to promote planning and coordination on the regional scale.

State and locally sponsored groups promoting regional approaches to problems include:

1) Air Pollution Control Districts
2) Basin Coordinating Councils
3) State Planning Offices
4) Economic Development Districts
5) Citizens Advisory Groups

3. Limitations in Existing Coordination Frameworks

Existing regional coordination arrangements have four major limitations for coordinating air quality planning and implementation with other environmental protection, transportation, and land-use activities.

a. Lack of Air Quality Element. Regional planning agencies, whether COG's or RPC's, seldom consider the air quality implications of land-use and transportation plans and growth policies. This is due to 1) lack of information on the relationshp between land-use and air quality, and 2) lack of air quality expertise on their staffs.

b. Late Air Quality Input. Although the A-95 review process must be used to process the AQMP, several conditions must be considered.

The very fact that an AQMP has been prepared for the A-95 review indicates that growth projections, control strategies, and coordinate frameworks have been considered. The best alternatives have probably been selected from the several available. If the A-95 review process is the first contact that a group or agency has had with the AQMP, it can expect to make revisions and to resolve further conflicts. Therefore, coordination is extremely important in the early planning stages before the AQMP is prepared for A-95 review. Implications of land-use and transportation programs and policies on air quality maintenance strategies must be identified early enough to permit analysis and consideration while alternatives are being formulated and evaluated. Such early coordination should greatly reduce confrontations over air quality and land-use and transportation objectives in the implementation phase.

Probably, the greatest value of the A-95 review agency is that it may provide invaluable information on who to contact in preparing the AQMP.

c. Advisory Role of COG/RPC's. RPC's and COG's are both procedural mechanisms to deal with common regional multijurisdictional problems. They perform as advisory bodies and forums for communication. Although some authority is provided through the A-95 review process and through their designation as metropolitan transportation planning agencies, these agencies do not generally have the authority to enforce land-use or emission controls consistent with a regional plan. COG's view their role as one of fostering communication and not as one of controlling regional planning.

d. Voluntary Participation in COG's. COG's are multifunctional voluntary regional associations of governments represented by local officials. Typically, they have no governmental powers or operating responsibilities. They cannot compel participation, attendance, or acceptance of policy decisons. In effect, their existence depends on the good will of constituent local governments (ref. 1).

4. General Considerations for selecting Coordination Frameworks

State and local agencies should consider the following aspects of various institutional arrangements in deciding how they will organize and carry out their air quality maintenance activities.

a. The air quality maintenance system, encompassing both planning and implementation, should be established on an appropriate areawide scale. It should deal with interactions occurring between air quality and growth and development throughout the air basin that is the geographic base for the air quality maintenance process and plan. Normally, this will be larger than a single city and often larger than a single county.

b. The system should reflect integration between air pollution control objectives and other State and local activities affecting or affected by air quality considerations. This would appear to require:

1) Use of a uniform set of growth and development projections and policies in all components of the area's comprehensive plan including the air quality maintenance component of that plan.

2) Incorporation in other components of the comprehensive plan of the constraints necessary to attain and maintain air quality standards.

c. Because of the complexity of relating air quality considerations to land-use and other growth and development decisions, unilateral planning and implementation either by any one level of government or by any one agency should be avoided. This means that the system should encompass intergovernmental and interagency coordination and consultation with concerned groups, including the general public, is also highly desirable.

d. Because the system is likely to rely heavily on intergovernmental arrangements, it should include procedures for resolution of conflicts that might otherwise impede preparation or implementation of the AQMP. Effective capacity to establish an areawide consensus on growth and development projections and appropriate maintenance policies is essential because this consensus forms the base on which the AQMP will be built.

e. Within such guidelines and constraints as the State may deem necessary, it is desirable that responsibility for whatever land-use-related decisons are necessary for air quality maintenance be delegated to the governmental level most directly involved in determining the area's growth and development. Similarly, responsibility for regulating emissions should be delegaged, whenever practicable, to an appropriate local or regional air pollution control unit. In general, delegation of maintenance responsibility should be made, to the extent practicable, to those levels of government that are closest to the problem and its solution. Higher echelons of government should assume maintenance responsibility only to the extent necessary to ensure preparation of an adequate areawide AQMP and compliance therewith.

f. The Federal Government does not intend to impose any particular institutional or organizational arrangement. However, the Clean Air Act does require that SIP's (and thus the AQMP part thereof) contain adequate provisions for intergovernmental cooperation.

g. AQMP's prepared and implemented at the State and local levels are likely to be more reflective of local public goals and desires than would be a plan that the Federal Government is obliged to prepare in case a State fails to submit an approvable plan.

h. While cooperation and participation of various agencies in the AQMP process is desirable, if not essential, it is also advantageous to retain a clearly defined point of responsibility and authority for air conservation.

i. The participation of various units of local government in the AQMP process is desirable but, on the other hand, there is great merit in having a single agency carry ultimate responsibility throughout an entire AQMA.

j. Air pollution control agencies are generally the best suited for conducting air pollution planning and control activities but, at the same time, they do not often embody the ability to consider the multiple facets of general community planning for growth and development. Therefore, collaborative activities of air quality agencies with comprehensive planning agencies is usually desirable.

k. In any institutional arrangement for developing an AQMP, provisions should be made to guard against one agency or task group preparing an overly ambitious or unrealistic plan which other agencies that are later responsible for implementation will find to be unworkable or unacceptable. Such a situation can be avoided by including representatives of the implementing agencies in the planning process.

l. In selecting the agencies to be responsible for implementation of the AQMP, consideration should be given to the kinds of functions presently being carried out by existing agencies. The desirable assignments might be such that the most capable and experienced agency would be given the new functions, with such modifications as may be needed. At the same time, consideration should be given to new innovative institutions that would improve effectiveness. Obviously, duplication and overlapping of functions among several agencies should be avoided.

m. As indicated previously, the State is ultimately responsible for all AQMP matters and thus will exercise some sort of review and approval authority over actions at lower levels of government. In the same vein, if planning or implementation is carried out by local governments at a subregional level, it may be appropriate to provide for some kind of overview, and perhaps veto power, at the regional level to ensure that local actions are consistent with overall regional plans and policies.

D. EXAMPLE MODES OF COORDINATION

Four possible modes for the division of responsibility between State and local governments in preparing and implementing the air quality maintenance plan can be conceptualized. While actual conditions will probably require a combination of approaches, the modes are described as discrete entities for guidance to the States. The general conditions of State-local relationships and air pollution problems that warrant the use of each mode are described.

1. Mode 1

The State Agency conducts all AQMP preparation and implementation activities within the State. Regional and local agencies, governing bodies, and other groups only provide requested information to the State. Local and regional participation is less than in any of the other modes.

This situation is appropriate in the following instances:

Where no planning or air pollution control expertise is available at the local and regional levels.

- Where the full technical capability to prepare and implement the AQMP exists at the State level.
- Where the State agency can exercise the necessary implementation measures required by the AQMP.
- Where local governments are willing to allow the State to retain full AQMP preparation and implementation responsibility.

2. Mode 2

The State agency participates with regional and local agencies in preparing and implementing the AQMP. All or part of the tasks for any or all AQMP's will be performed by regional and local agencies by mutual agreement between the State and the agencies. The State agency would review and approve all plan elements prepared by the local agencies.

This approach recognizes variations between AQMA's with regard to complexity of air quality maintenance problems, differences in AQMA jurisdictional composition, and local plan implementation capabilities. Joint State/local efforts are generally warranted:

- Where there is sufficient legal authority at the local level to execute proposed control strategies.
- Where sub-State districting for air quality (Regional Air Pollution Control Districts, etc.) or other planning (COG's RPC's) purposes has occurred and air quality maintenance is a feasible and logical extension of existing activities (addition of an air quality element).
- Where a sub-State entity wishes to maintain higher standards of air quality than required by the State plan, including the establishment of standards for pollutants not covered therein.
- Where specific technical capability and/or experience not available at the State level exists at the sub-State level.

3. Mode 3

Preparation of the AQMP is done jointly by State and sub-State agencies; implementation is done by sub-State agencies.

This mode might be used:

- Where there is a strong local implementation capability particularly where local capability is stronger than the State's capability for implementation.
- Where implementation will be relatively easy (few pollutants, no interjurisdictional problems).

- Where it is not feasible to involve a multitude of sub-State agencies in an actual working capacity.

4. Mode 4

Preparation of AQMP is done jointly by State and local agencies, but all implementation is done by the State.

This mode may be used:

- Where the State agency is capable of such decentralization as may be required by the location of AQMA;
- Where there is local planning capability strong enough to assist the State agency in plan preparation;
- Where there is insufficient legal authority to allow local participation in plan implementation;
- Where the air pollution problem is of such a nature that no local implementation activity is required;
- Where, for any reason, local agencies wish to participate in preparing the plan but not in its implementation.

E. APPROACHES TO INTERSTATE MANAGEMENT SITUATIONS

While most AQMA's probably will be located entirely within one State, a substantial number may include territory within two or more States. A single plan covering the multistate area or a set of compatible State plans may be prepared.

State plans shall include specific descriptions of the measures proposed to achieve the required interstate coordination of air quality maintenance activities. Such measures may include the use of existing interstate agreements, compacts or noncompactual, or new agreements.

1. Preparation for Interstate Coordination

In an interstate AQMA, or where interstate transmission of air pollutants affects air quality maintenance, it is not possible to determine unilaterally which type of agreement is needed.

Each State affected by interstate coordination requirements should establish an interagency task force on interstate coordination. These groups would meet with their counterparts in the adjoining State(s), define precisely the coordination problems, determine the appropriate course of action, and establish the arrangements needed.

Each task force should include representatives of the State and local air pollution control agencies, the State land-use planning agency, and the State transportation planning agency legal counsel, and appropriate regional planning agencies. EPA representatives will attend joint work sessions of these tasks forces upon request of the States.

2. Noncompactual Mechanisms

Required coordination of air quality maintenance activities between or among States may be met through noncompactual mechanisms. This approach may be used where the States and EPA are mutually satisfied that such arrangements are satisfactory in view of:

- The particular pollution problems of the multistate area; or
- The existence of, or proposals for, innovative noncompactual devices adequate to meet Federal requirements for interstate coordination.

The States' Letter of Intent to Cooperate in the SIP may provide a basis for developing noncompactual coordinating mechanisms.

3. Interstate Compacts

Air quality maintenance planning and implementation activities within interstate AQMA's can be carried out by a single agency created by interstate compact. The Congress, in The Clean Air Act, has given consent for the States to negotiate and enter into agreements or compacts that are not in conflict with any law or treaty of the United States, and the establishment of such agencies as are deemed desirable for making effective such agreements or compacts. Such agreements or compacts are not binding or obligatory upon the States that are party thereto until they have been approved by the Congress.

Since compacts are complex instruments, considerable time may be required for their drafting and enactment. Time constraints in the preparation of the AQMP and the complexity of the process may preclude drafting and enactment of enabling legislation and agreements prior to plan submission. In such a case, State plans must, as a minimum, include the following:

- A listing of the major tasks required for drafting and enacting the compact, including a schedule of target dates for their completion and for enactment of the compact;

- A demonstration that the several States have each made significant progress toward creation of the compact;
- A discussion of any legal problems that must be resolved before the compact can be enacted;
- A description of the noncompactual mechanism that will provide the necessary interstate coordination of air quality maintenance activities in the period prior to enactment of the compact.

State plans should present the above information in a uniform manner and for each compact, if more than one is proposed.

F. PLAN PREPARATION SEQUENCE AND CHECK LISTS

Functions that must be performed during the preparation of the AQMP are listed in table II-1 and shown sequentially in figure I-3. Their functions will be performed by the State Air Pollution Control Agency or the State or sub-State Agency designated by the State to prepare the AQMP.

The first function is to establish the basis for coordination and cooperation. This involves the identification and contacting of all agencies and groups that will be involved in the process. Figure II-1, "Checklist for Agencies Involved in Preparation and Implementation of AQMP," is presented in this section as an aid in identifying these agencies and groups. This checklist provides entries for defining the task expected of each group and agency and the coordination relationships that exist among them. Consideration should be given to the fact that an agency or group may be involved in both preparation and implementation of an AQMP but that its task and/or coordination mechanism may be different for these phases. In such a case two entries should be made for the agency or group; one for implementation and one for preparation. In some cases it may even be worthwhile to further subdivide implementation into planning and enforcement.

Once the existing agencies and groups, their coordination mechanisms, and their tasks have been defined, the task of each agency or group should be evaluated separately. To facilitate this evaluation, figure II-2 "Agency Requirement Checklist," is suggested. Again, if the function of a given agency or group is different for different phases of AQMP preparation and implementation, several entries should be made.

Table II-1. Suggested functions requiring coordination in the preparation of the Air Quality Maintenance Plan

Plan preparation task	Governor's office	Coordination should be effected with State and local agencies having responsibility for the function as indicated										Public information, participation, and involvement
		Air pollution control		Transportation & land-use planning		Legal		Economic analysis		Development		
		State	Local	State	Local	State	Local	State	Local	State	Local	
Establish basis for cooperation & coordination	x	x		x		x				x		
Delineate roles & missions of State & local agencies		x		x								
Review SIP existing air quality & emissions, and other plans		x	x	x	x			x	x	x	x	
Determine adequacy of emissions & air quality data		x	x									
Refine AQMA boundaries		x	x	x	x					x	x	x
Develop growth factors & development patterns		x	x	x	x			x	x	x	x	x
Perform analysis of 1975-1985 air quality situation		x	x									
Quantify air quality maintenance requirements		x	x									
Characterize projected emissions		x	x									
Develop alternative maintenance strategies		x	x	x	x	x	x	x	x	x	x	x
Evaluate alternative maintenance strategies		x	x	x	x	x	x	x	x	x	x	x
Select preferred maintenance strategies		x	x	x	x	x	x	x	x	x	x	x
Conduct internal State review of plan		x	x	x	x	x	x	x	x	x	x	
Revise plan & announce public hearing		x		x		x						x
Hold public hearings		x		x		x						x
Revise and adopt plan	x	x	x									x
Submit plan to administrator, EPA	x											x

To be Filled Out by the State Air Pollution Control Agency
or its Designee for the Preparation of the AQMP

AGENCY	Contacted for Input Into AQMP Preparation and/or Implementation		Agency Task in Preparation and/or Implementation of AQMP	Reviewed Final AQMP		Existing Mechanism for Coordination (Advisory Board, Review, COG, RPC, Working Group, etc.)
	Yes/No	Date		Yes/No	Date	
STATE AGENCIES						
State Air Pollution Control Agency	yes	9-10-74	1. Write AQMP with input from other agencies and groups. 2. Implement AQMP with county APCA.		12-2-74	Advisory Board of County Elected Officers. Working group of Regional COG, State Planning Office and State APCA.
Department of Health						
State Office of Planning						
State Clearinghouse						
State Highway Department						
Other (Specify)						
Other (Specify)						
Other (Specify)						

Figure II-1. Checklist for agencies involved in preparation and implementation of AQMP.

AGENCY	Contacted for Input Into AQMP Preparation and/or Implementation		Agency Task in Preparation and/or Implementation of AQMP	Reviewed Final AQMP		Existing Mechanism for Coordination (Advisory Board, Review, COG, RPC, Working Group, etc.)
	Yes/No	Date		Yes/No	Date	
REGIONAL AGENCIES						
COG						
RPC						
Economic Development District						
Regional Air Pollution Control District						
Regional Citizens Advisory Group						
Coastal Plains Commission						
Other (Specify)						
Other (Specify)						
Other (Specify)						

Figure II-1. Checklist for agencies involved in preparation and implementation of AQMP--Continued.

AGENCY	Contacted for Input Into AQMP Preparation and/or Implementation		Agency Task in Preparation and/or Implementation of AQMP	Reviewed Final AQMP		Existing Mechanism for Coordination (Advisory Board, Review, COG, RPC, Working Group, etc.)
	Yes/No	Date		Yes/No	Date	
LOCAL AGENCIES						
Municipal Governments in AQMA						
Municipal Community Planners						
Municipal Transportation Planners						
Local Health Department						
Local Water and Sewer Departments						
Local Zoning Commission						
Local Solid Waste Disposal Departments						
City or County Air Pollution Control Agency						
Other (Specify)						
Other (Specify)						

Figure II-1. Checklist for agencies involved in preparation and implementation of AQMP--Continued.

AGENCY	Contacted for Input Into AQMP Preparation and/or Implementation		Agency Task in Preparation and/or Implementation of AQMP	Reviewed Final AQMP		Existing Mechanism for Coordination (Advisory Board, Review, COG, RPC, Working Group, etc.)
	Yes/No	Date		Yes/No	Date	
CITIZENS GROUPS						
Environmental Groups and Clubs						
Public Interest Groups						
Representatives of Business & Industry						
Representatives of Utility Companies						
Other (Specify)						
Other (Specify)						
Other (Specify)						

Figure II-1. Checklist for agencies involved in preparation and implementation of AQMP--Continued.

CHECKLIST 2

AGENCY REQUIREMENT CHECKLIST

To Be Filled Out for Each Agency, Governmental Body, or Other Group Involved
in AQMP Preparation and Implementation

AGENCY	TASK	Date task needs to be completed.	Can the agency perform the task?	Is legal authority needed by the agency?	Is authority available?	If authority is not available, what does it take to get it?	When can legal authority be obtained?	Will agency perform the task by date needed?	Does agency need money to perform task?	If the agency does not perform the task, who will?	Is task complete?

Figure II-2. Agency requirement checklist.

Figures II-1 and II-2 are recommended for use by the States in providing information on coordination to EPA in the AQMP. If these figures are not submitted with the AQMP, they should be retained by the State for future reference. These figures should serve as a main guide in evaluating the ability of existing agencies and coordination frameworks to prepare and implement an AQMP. They should also provide the basis for selecting the best coordination mode available to each State. Finally, any need for establishing different coordination frameworks, the addition of air quality elements to existing planning groups, the creation of new agencies, the improvement of technical capability, or additonal funding should be highlighted with these checklists.

G. PUBLIC PARTICIPATION

A regulatory program that impacts on as many interest areas as does air pollution control requires public awareness and support in order to achieve reasonable success. This is particularly true for the implementation of several of the unique control strategies that are, or will be associated with, maintenance control plans. It is important, therefore, that the public be reasonably informed of the concepts, objectives, and implementation procedures of maintenance plans. This can be accomplished through news releases, hearings, task force meetings, speaking engagements, etc. Because of the importance of public support, it is urgent that activities involving and informing the public be initiated in the early stages of plan development and continued with timely news releases, meetings, etc. Citizens should be provided, to the extent possible, with opportunities to assist in defining planning goals, defining the impact of feasible alternatives, and identifying public preferences for these alternatives. This should result in a more informed and supportive public at the time of hearings on the adoption of the plan. This support should also be evident during the implementation of some of the more controversial control strategies.

REFERENCES

1. Advisory Commission on Intergovernmental Relations. Regional Decision Making: New Strategies for Substate Districts, Washington, D.C., October 1973, p. 50.
2. Advisory Commission. Regional Decision Making, p. 141.
3. T. C. Tryzna. Environmental Impact Requirements in the States, EPA-RS-73-024, Environmental Protection Agency, Washington, D.C., July 1973.

Chapter III: REVIEW OF EXISTING DATA AND RESOURCES

A. INTRODUCTION

The State shall identify in its AQMP's the data used as a framework for the development of maintenance strategies. Furthermore, sources of such data shall be cited, and the basis for accepting such data as being valid shall be stated.

B. EMISSION INVENTORY

While air quality is the final measure of success of a pollution control program, whether it be directed toward either attainment or maintenance of NAAQS, the emission inventory, and changes therein, is the base on which control measures and strategies can be developed. An accurate, up-to-date inventory is essential. Furthermore, this inventory must be entered in the NEDS in order that EPA personnel, acting for the Administrator, may have available the most recent and reliable data on which to base the evaluation of a State's AQMP.

Procedures for compiling and updating an emission inventory are not given here. These procedures are well documented in APTD 1135, Guide for Compiling a Comprehensive Emission Inventory (ref. 1), and in Guidelines for Air Quality Maintenance Planning and Analysis, vol. 7, Projecting County Emissions. The latter document is issued as one of the series especially prepared to assist States in the preparation of AQMP's. Emission factors, per se, are found in AP-42, Compilation of Air Pollutant Emission Factors (Revised 1973) (ref. 2); a procedure for estimating emissions from motor vehicles is given in EPA-450/2-73-003, An Interim Report on Motor Vehicle Emission Estimation (ref. 3).

C. EMISSION PROJECTIONS

Emission projections form the link that permits the estimation of future air quality from relationships between current emissions and existing air quality. For the AQMP the emission projections of concern are those that account for the increases in emissions attributable to all aspects of community growth and development.

Techniques for preparing emission projections are presented in reference 2. These are also briefly discussed in chapter IV, below. The States must use the best available data for the projections and either that data must be included as part of the plan or the data sources available to EPA must be cited.

A key element for the development of emissions projections will be the Projections of Regional Economic Activity (OBERS Projections) prepared by the U.S. Department of Commerce, Bureau of Economic Analysis (BEA). These projections have been obtained by EPA for each AQMA listed by the Administrator and are available from the appropriate Regional Office. These projections are prepared by disaggregation of national projections on a shift-share basis and are modified by local economists for each region. Further modifications to the BEA projections may be justified for AQMP purposes as a result of studies and planning documents prepared by metropolitan, county, regional, or State planning agencies. Studies of four general types may be available. These are:

Transportation studies. These may contain projections for routes, traffic, demand, highway construction, and may even predict vehicle emissions. Submission of such studies to DOT is in many cases required by law.

Land-use studies. These would contain zoning and growth information that would prove valuable in determining the potential for industrial growth, commercial development, and new housing starts.

Air quality or water quality studies. These might contain similar calculations or specify data sources that would be helpful.

Energy or fuel-use studies. The energy crisis occasioned a number of studies concerning present and projected fuel use that should be consulted. The accuracy of some may not be acceptable because of the very short time in which they were performed.

Utility and service studies. Near-term growth within an AQMA may be indicated by plans for expansion of natural gas and electric power service distribution, sewer line extensions, and sewage disposal facility construction.

There is a wide variation in the quality and detail of such studies and in the likelihood of their being realized as the patterns to which growth will adhere. Judicious appraisal of the confidence to be placed in such plans must be made and, if such plans are used, the appraisal should be included in the AQMP documentation.

D. AMBIENT AIR QUALITY DATA

Adequate ambient air quality data are essential to the process of developing control strategies for either attainment or maintenance. If atmospheric dispersion models are to be used for evaluating strategies, air quality data are required for model calibration; if proportional adjustment techniques (rollback; rollforward) are to be used, current air quality data provide a necessary base.

Just as with the emission data, evaluation procedures for AQMP's will require that the ambient air quality data used in the preparation of the plan be entered in the appropriate EPA data bank--in this case, the Storage and Retrieval of Aerometric Data (SAROAD) bank.

The period of record for the ambient air quality data must coincide with the period of the base year emissions inventory. As a general rule, data for an annual period are considered valid if valid data for three calendar quarters are available. Correspondingly, data for a calendar quarter are considered valid if 75 percent of the scheduled measurements are available.

Whether data from several air quality monitoring sites are used individually or are averaged to provide a single value "representative" of the AQMA depends on the techniques being used to develop and evaluate control strategies. Proportional adjustment procedures (rollback, or rollforward) can use only a single value; atmospheric dispersion models, on the other hand, can best be calibrated by the use of several air quality values because these models can account for differences in air quality between locations. In the event that monitoring data from a single site are used, that site must be the representative site giving the highest ambient concentration values within the AQMA.

E. METEOROLOGICAL DATA

Application of atmospheric dispersion models requires meteorological data, often in a special format. Data suitable for use with the Air Quality Display Model (AQDM) for each AQCR is available through EPA Regional Offices. Data in other formats, as required for specific models, can be obtained by special order from the Environmental Data Service, National Climatic Center, Federal Building, Asheville, N.C. 28801.

F. GOVERNMENTAL STRUCTURES

One of the most important resources available for the preparation and implementation of the AQMP is the existing structure of governmental and quasi-governmental organizations functioning with the AQMA. These groups and their potential contributions to air quality maintenance have been thoroughly discussed in chapter II, above, and the need for considering the product of one-type organization, viz. the planning groups, has been pointed out.

The preparation of the AQMP should take advantage of the specialized knowledge, the trained manpower, and the established coordinating mechanisms available among these organizations. The use of existing structures to assist in, or to completely carry out, the implementation of specific control measures is encouraged.

REFERENCES

1. U.S. Environmental Protection Agency, Office of Air and Water Programs, Office of Air Quality Planning and Standards. Guide for Compiling a Comprehensive Emission Inventory (Revised). APTD 1135. Research Triange Park, N.C., March 1973.

2. U.S. Environmental Protection Agency, Office of Air and Water Programs, Office of Air Quality Planning and Standards Compilation of Air Pollutant Emissions Factors (Second Edition). AP-42. Research Triangle Park, N.C., April 1973.

3. David S. Kircher and Donald P. Armstrong. An Interim Report on Motor Vehicle Emission Estimation. Environmental Protection Agency, Office of Air Quality Planning and Standards, EPA 450/2-73-003, Research Triangle Park, N.C., October 1973.

Chapter IV: AQMA ANALYSIS

A. INTRODUCTION

As required by 40 CFR 51.12(g)(1), an analysis must be performed on each of the areas designated as AQMA's to determine the impact of growth and development on air quality for the period 1975-1985. If the analysis indicates that NAAQS will not be maintained, the States must develop a plan to ensure that the standards will be maintained. The plan must specify a maintenance strategy that provides for control or accomodation of the increased emissions that will result from growth and development within the AQMA.

Analysis of the AQMA is required to determine the nature and extent of the potential air quality problem and to sufficiently quantify the problem to permit the development of an appropriate maintenance strategy. Procedures for analysis of AQMA's are presented in subsequent sections of this chapter. A methodology for the design and selection of a maintenance strategy is described in chapter V.

B. PROCEDURES

The AQMA analysis entails the following:

- Refinement of AQMA boundaries
- Projection of emissions to 1985 considering:
  - Present emissions by source category and, if possible, by location
  - Expected growth of each source category, based on past and probable future trends
  - Present and probable future emissions of new and existing sources.
- Allocation of the projected emissions to subareas within the AQMA.
- Estimation of 1985 air quality concentrations from projected emissions.

- Quantification of air quality problems.

The following tasks are required to analyze the AQMA and accomplish the procedures described above.

1. Develop Growth Factors and Development Patterns

Detailed instructions for the development of growth factors are contained in Guidelines for Air Quality Maintenance Planning and Analysis, vol. 4, Projecting County Emissions.

Local sources such as power companies, gas companies, fuel dealers, economic development planners, chambers of commerce, and land-use planners are usually the best source of information for the development of growth factors, especially for major sources. Particular attention should be paid to power plants because growth in this category can result in considerable increases in emissions. State finance and budget departments, large banks, and savings and loan institutions can provide information on local growth factors. Because emissions from fuel combustion processes make up a large part of the emissions within an area, special consideration should be given to the development of growth factors to provide estimates of future fuel use by type (coal, light oil, heavy oil, gas, electricity) for each source class (residential, multifamily, commercial, institutional, small industrial, large industrial, and power generation). Vol. 7 of this guideline series, Projecting County Emissions, provides a vehicle for developing such growth factors. In the absence of local data, growth projections published by the Bureau of Economic Analysis, U.S. Department of Commerce, can be used. As a minimum, growth factors must be developed, on a county basis, for each of the Nationwide Emission Report (NER) categories included in the Level 1 Method described in the EPA guideline document reference above. Growth factors used in the AQMA should be recorded and reported in the form described in the same document.

2. Refine AQMA Boundaries

Because the initial AQMA designation was based on overall growth and development factors, refinement may be necessary when more precise growth factors and development patterns are taken into consideration. EPA will establish procedures for early revision of AQMA boundaries, including deletion of areas from the AQMA if the need develops. Until such publication, the procedures described below may be used.

The data developed in step 1 above must be analyzed to identify areas within the initial AQMA geographical area where no growth and development are expected. In such a case consideration should be given to the elimination of the area from the AQMA. The decision to eliminate a portion of the AQMA should be based on whether exclusion would create islands within the AQMA or changes in the peripheral boundaries. In the first case, the area must be retained in the AQMA. De facto exclusion could be accomplished by not applying any specific maintenance measures to sources within it. In the second case changing the boundaries to exclude the area from consideration may be preferable.

The analysis should also be used to identify areas contiguous to the AQMA in which growth and development may result in emission that, through transport, would threaten the NAAQS. In such a case consideration should be given to expanding the AQMA boundaries to include such areas. The decision to include or exclude such areas from the AQMA will of necessity be judgmental and subjective. The decision to include or exclude should be based on whether the area contributes to emissions that could threaten NAAQS and that could be controlled by measures available to the agency responsible for plan implementation. For example, an area from which fugitive dust emissions from open undeveloped spaces pose a threat to NAAQS would most likely be excluded from the AQMA because the emissions are natural and are not amenable to controls. On the other hand, if the fugitive dust emissions are the result of agricultural or quarrying processes, the area could well be included in the AQMA if control can be effected through changes in operating practices.

Changes in AQMA boundaries are reported by narrative and overlayed maps.

3. Perform Analysis of the Air Quality Situation

The first step in this task is the projection of current emissions to 1975/1980/1985. These projections are done on a county basis using the methodology described in Guidelines for Air Quality Maintenance Planning and Analysis, vol. 7, Projecting County Emissions.

A Level 2 or Level 3 approach should be used unless prior approval for use of the more simplistic Level 1 approach is obtained through consultation with the appropriate Regional Office.

NEDS emission data shall be used as the basis for these emissions projections. Other emissions data that may be locally available may be used in lieu of or in addition to the NEDS data, provided that such data be entered into the NEDS at the next semiannual update. The update is to be accomplished as prescribed in APTD-1135, Guide for Compiling a Comprehensive Emissions Inventory. Forms prescribed in the EPA guideline document covering county emission projection shall be used for this purpose. Locally available data shall be so identified, and the AQMP shall contain a statement to the effect that these data will be entered into the NEDS.

Next, the county emissions projections, except for hydrocarbon and nitrogen oxides, are disaggregated and distributed to subareas within the individual counties. A procedure for allocating or distributing the projected emissions to specific subcounty land areas is forthcoming. Pending distribution of these procedures, States may use locally available or developed techniques after consultation with the appropriate Regional Office. The emissions distribution step of the analysis is necessary to define the areas that would have the highest emission densities and to provide assigned grid coordinates for emission sources if an atmospheric dispersion model is to be used to estimate pollutant concentrations. The recommended procedure is outlined briefly below.

The grid system or other subarea division of the counties in the AQMA first must be established. The emissions are allocated to the subareas in four different categories:

- Stationary area sources
- Power plants
- Point sources (excluding power plants)
- Mobile sources.

Area source emissions may be allocated by a computer-assisted method (CAASE) if projected growth rate can be input, so that the allocation process represents the projected conditions rather than current conditions. CAASE is also described in the above referenced guideline series. Otherwise, area sources may be distributed manually using the same types of emission indicators that are used in CAASE, such as population and industrial employment.

Emissions from existing and proposed power plants can all be assigned specific grid coordinates.

Point source emissions from existing facilities and their attendant expansion can be located by their grid coordinates as reported in the NEDS. Emissions from undefined new point sources can be distributed with the aid of land-use plan data and survey results with one of the following procedures:

- A weighting system that evenly distributes emissions among those industrial zones that the regional planning agency indicates would be most likely to attract new manufacturing plants.
- A weighting system that distributes emissions based on an industrial growth plan.

The allocated emissions are summarized for input to a dispersion model or other analysis by specifying point-source emissions (including power plants) by grid coordinate and totaling the remaining emissions for each grid. Procedures outline in the EPA guidelines document, Analytical Framework Guidelines, are used for this purpose.

Hydrocarbon and nitrogen oxides emissions must be aggregated to arrive at AQMA-wide emissions. This involves simple addition of the county emission projections. Forms specified in the referenced guideline document are used to record and report the results of this subtask. If suitable measurement methods have been available, emission should be in terms of nonmethane hydrocarbons. The use of total hydrocarbon emissions, however, is acceptable.

The projected emissions are now used to drive an air quality projection model to estimated 1980 and 1985 air quality. The following are the types of models to be used for the pollutant indicated:

- Particulate Matter - Atmospheric Dispersion Model
- Sulfur Oxides - Atmospheric Dispersion Model
- Nitrogen Oxides - Rollback (total regional emissions)
- Hydrocarbons - Appendix J Relationships (Rollback Model for Texas and California)
- Carbon Monoxide - Rollback Model described in Guidelines for Air Quality Maintenance Planning and Analysis,

vol. 1, Designation of Air Quality Maintenance Areas

Acceptable models for projecting air quality are described in Guidelines for Air Quality Maintenance Planning and Analysis, vol. 12, Applying Atmospheric Simulation Models to Air Quality Maintenance Areas. Locally available models may be used provided that the AQMP contains a description of the model, procedures for use, and input data format and requirements. Results of air quality projections are to be reported using the formats specified in the referenced guideline document.

If the air quality projections indicate that NAAQS will not be exceeded through 1985, there is no requirement for further analysis or the development of a maintenance strategy. The agency responsible for the preparation of the AQMP should now assemble the AQMP as described in chapter VI. If the air quality projections indicate that the NAAQS will be exceeded at some time during 1975-1985, analysis should continue to identify and quantify the air quality problem.

4. Quantify Air Quality Maintenance Requirements

Maintenance requirements, expressed in emission reduction required to compensate for growth and development, must be quantified to serve as the basis for the development of a suitable maintenance strategy. For oxidants and nitrogen oxides, this quantification is made on an AQMA-wide basis. Quantification by subareas within the AQMA, as required by the preceding analysis, must be made for the other criteria pollutants.

The first step in the quantification process consists of interpolation of emission projections for years other than 1975, 1980, and 1985. A straight-line interpolation may be used for this purpose. However, it is desirable that power plants be treated individually with adjustments made for stack height and added to the year in which they are scheduled to become operational or go out of service. This procedure can be accomplished using the format presented in table IV-1. An example using the following dummy information is included in the table:

1975 Emissions (attainment)	50,000 tons
1980 Emissions (projected)	60,000 tons
1985 Emissions (projected)	80,000 tons

Table IV-1. Calculation sheet, quantification of maintenance strategy requirement

AQMA____________________, Pollutant____________________

Subareas Subarea 1	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Projected emission	50000					60000					90000
Emissions w/o new power plants	50000					60000					72000
Interpolated emission	50000	52000	54000	56000	58000	60000	62400	64800	67200	69600	72000
Power plant emissions								18000	18000	18000	18000
Total projected emissions	50000	52000	54000	56000	58000	60000	62400	82800	85200	87600	90000
Emissions at NAAQS	58000	58000	58000	58000	58000	58000	58000	58000	58000	58000	58000
Maintenance requirement	---	---	---	---	---	2000	4400	24800	27200	19600	32000
Subarea 2											
.											
.											
.											
.											
.											
.											

- Power Plant Growth: plant with projected controlled emissions of 8,000 tons scheduled to go on line in 1982
- Emissions associated with NAAQS 58,000 tons.

Using this procedure it can be determined that subarea 1 will require a maintenance strategy capable of reducing emissions starting in 1980 by 2,000 tons per year and building up to a 1985 requirement of 22,000 tons per year with a sharp increase in 1982 due to a new power plant.

5. Characterize Projected Emissions

Major source categories and timing of increased emissions are identified in this step. The source of expected emission increases dictates the type of control strategy that will be required. For example, if a single source or source category represents the principal contributor to increased emissions, the use of a source control more stringent than that currently specified in the SIP may be indicated.

The detail to which source categories will be identified is dependent on the level to which emissions projections were made (step 3, above). Using the example shown in table IV-1, it can be seen that emissions from power plants represent the major contributions of emissions that would threaten air quality in subarea 1. The maintenance strategy for this area should be designed with this in mind.

Chapter V: DEVELOPMENT OF MAINTENANCE STRATEGIES

A. INTRODUCTION

A maintenance strategy is defined as the combination of measures designed to achieve the aggregate reduction of emissions necessary for the maintenance of a NAAQS. Maintenance measures are controls that are applicable to specific source categories, pollutants, and/or air quality maintenance problems.

Detailed descriptions of several potential air quality maintenance measures are presented in volume 3 of this guideline series, Control Strategies. The 18 measures cover a broad range of options but are not intended to be all-inclusive. Those responsible for plan preparation are encouraged to devise other measures with special applicability to the AQMA's in which they are to be employed.

A summary of the descriptions for each of the measures is provided in appendix D. The first nine listed have been categorized as land-use and planning measures because they are concerned primarily with planning for future air quality and with new emission sources. The remaining nine measures have been categorized as emission control measures, and involve technological or operational changes that affect both existing and new sources. The latter measures tend to have a more direct effect on emissions from individual sources and, hence, their impacts can be quantified more readily than those of the land-use and planning measures.

Because of the tenuous relationship between hydrocarbon and oxidant concentrations, special consideration must be given to the development of maintenance strategies for oxidant control. Such strategies should be sufficiently flexible to accomodate any change in the current relationship that might result from the research and development programs presently underway. The state-of-the-art does not permit a quantification of the interrelationships and tradeoffs in HC/O_X control. Qualitatively, however, it is necessary to reduce the HC and NO_X emissions so that the HC/NO_X ratio is below 1. Priority should be on highly reactive hydrocarbon emissions, especially those generated during early morning hours. While it is highly desirable that strategies be developed based on nonmethane hydrocarbon emissions and measurements, strategies based on the reduction of total hydrocarbon are acceptable in the absence of suitable measurement methods for nonmethane hydrocarbons.

The recommended procedure for selecting a preferred group of maintenance measures, i.e., a maintenance strategy, has two major stages:

- Development of alternative maintenance strategies
- Selection of preferred strategy based on economic and social acceptability evaluations.

Each of these stages and associated tasks are discussed in the following sections.

B. DEVELOPMENT OF ALTERNATIVE MAINTENANCE STRATEGIES

This is essentially a screening procedure by which potential maintenance measures are evaluated in the light of the air quality maintenance problem (identified and quantified as outlined in chapter IV) to generate feasible combinations of maintenance measures, each of which will provide the requisite aggregate control of emissions.

Current land-use and transportation plans adopted by cities, counties, metropolitan agencies, and other political jurisdictions wholly or partly within the AQMA may affect the ability to maintain air quality. These plans must be analyzed in the development of alternative maintenance strategies. Should the analysis indicate that major revision in the transportation and land-use plans are required in order to ensure that any set of maintenance measures will, in fact, result in the maintenance of air quality, the appropriate long-range strategy may be to develop a comprehensive land-use and transportation plan for the AQMA. In such a case the overall strategy could consist of a program to develop a comprehensive land-use and transportation plan with the initiation of a series of temporary emission reduction measures for the initial portion of the 10-year period. Upon completion of the comprehensive land-use and transportation plan, the State would develop an appropriate long-range AQMP. In such a case, the State must demonstrate the capability of developing a mechanism that ensures the development of a comprehensive plan that recognizes the requirement for the maintenance of air quality.

The following tasks are required:

1. Estimate Potential Further Reductions from Existing Sources

Before maintenance measures are examined, an analysis should be performed to determine whether more stringent controls on existing sources in the form of a revision in existing emission control regulations would be adequate to maintain standards. If the analysis indicates that such a revision alone would be sufficient, preparation of a more complex AQMP is not required. If this alternative is selected, the findings must be documented and be submitted as the AQMP. If more stringent controls on existing sources cannot provide the needed emission reduction, it may still constitute one of the maintenance measures in the AQMP.

Emissions projections made during the AQMA analysis provide data on projected emissions by NER category. Current control efficiency can be determined from State and local regulations. Figure V-1 provides a method of tabulating these data and recording potential additional control.

2. Determine Potential Source Category Candidates

The major contributing source categories, source categories with additonal control potential, and those with high percentages of new (from 1975 to projection year) emissions should be identified as the primary targets of selected maintenance measures. If there are multiple areas within the AQMA projected to exceed the standards, this determination should be performed separately for each, insofar as the resolution of the air quality projections and emission data allow.

3. Determine Maintenance Measure Applicability

This step involves determination of the applicability of the various maintenance measures that are available. First, measures that are not effective for the pollutants and source categories of concern should be eliminated from consideration. Measures that are effective for control of specific pollutants and types of sources are summarized in table V-1. Next, the possibility of establishing and implementing

Additional control potential

AQMA ______________, Subarea ______________, Pollutant ______________

Source category	1975			1980			1985		
	Emission, tons/yr	Percent control	Added control potential, tons/yr	Emission, tons/yr	Percent control	Added control potential, tons/yr	Emission, tons/yr	Percent control	Added control potential, tons/yr
Fuel combustion:									
Point									
Area									
Industrial processes									
Transportation									
Solid waste disposal:									
Point									
Area									
Miscellaneous:									
Point									
Area									

Note: The source categories are included as examples only. They should be further disaggregated depending on the level of analysis used as described in vol. 7 of this guideline series.

Figure V-1. Example format for indicating additional control potential.

Table V-1. Applicability of selected air quality maintenance measures

	Pollutants affected					Type of action(s)				Time for impact	
	TSP	SO_2	CO	HC/O_x	NO_x	Planning	Implementation		Review	< 5 years	> 5 years
							New	Existing			
Land use and planning											
Emissions allocation	x	x	x	x	x	x	x	x	x	x	x
Regional development planning	x	x	x	x	x	x	x		x		x
Emission density zoning	x	x					x	x	x	x	x
Zoning approvals	x	x	x	x	x		x		x	x	x
Transportation controls			x	x	x	x	x	x		x	x
Emission charges	x	x	x	x	x		x	x		x	x
Transfer of source location	x	x	x	x	x			x		x	x
Indirect source review			x	x	x		x		x	x	x
Environmental impact statement	x	x	x	x	x		x		x	x	x
Emission control											
New source performance standards	x	x	x	x	x		x		x	x	x
Revision of SIP control measures	x	x	x	x	x			x		x	x
Phaseout and prohibition	x	x		x	x			x		x	x
Fuel conversion	x	x			x		x	x		x	x
Energy utilization	x	x	x	x	x		x	x			x
Combination of emission sources	x	x	x	x	x	x	x				x
Special operating conditions		x					x	x		x	x
Stack height regulations	x	x					x	x		x	x
Control of fugitive dust sources	x						x	x		x	x

each remaining measure under consideration should be evaluated. Availability of resources necessary to implement and enforce the measure, time requirements, and legal authority are among the factors that should be considered.

It should be noted that the list of maintenance measures listed in table V-2 is not exhaustive. State and local agencies are encouraged to develop and use such additional measures as may be applicable. The agency developing the AQMP is responsible for finding the measure or combination of measures required to maintain NAAQS. State and local agencies are in a better position to select that combination of measures most likely to be acceptable and suitable, than if the control stragegy were developed and prescribed by a higher echelon.

4. Determine Contribution to Emission Reduction and for Air Quality Impact

Based on the projected emission inventories by source class, estimates of emission reductions or prevention that would occur as a result of implementing each applicable measure should be estimated. For many measures, e.g., emission allocation or stack height limitations, it is impossible to demonstrate their impact in this format. Instead, they generally require an atmospheric dispersion model analysis. If dispersion modeling is used to evaluate individual measures, it should be the same model and methodology that were used in the air quality projection step. If the same model is not used in the control measure evaluation, an explanation should be included in the AQMP. If neither an emission reduction nor a dispersion modeling analysis can be performed, a nonquantitative evaluation of the measure's effect should be prepared. For example, revisions to a regional land-use plan based on findings of the AQMA analysis may be an effective measure, but can only be quantified to the extent that accurate emission factors for different land uses are available. A description of the significance of the revisions would be more important than hypothetical emission rates indicating their quantitative impact.

Consideration of the effect of each measure on the spatial distribution of emissions is inherent in separate inventory analyses for each problem area and in dispersion modeling approaches. However,

Table V-2. Interrelationships among maintenance measures

	Emission allocation	Regional development planning	Emission density zoning	Zoning approvals & other indirect regulatory controls	Transportation controls	Emission charges	Transfer of emission source locations	Indirect source review	Environmental impact statements	New source performance standards	More restrictive source emissions limitations	Phase-out or prohibition of specified source categories	Fuel conversion	Energy conservation and utilization	Combination of emission sources	Special operating conditions	Stack height regulations	Control of fugitive dust sources
									Land-use and planning measures									
Emission allocation		C,O	A	O	C,I	O	A	C,I	I	C	C,O	C	A	C	C	O	C	C
Regional development planning	C,O		C,O	A	C,O	O	C	C	A	C	C	C	C	C	A	I	I	I
Emission density zoning	A	C,O		O	I	O	A	I	I	C	C	C	A	C	C	O	C	C
Zoning approvals & other indirect regulatory controls	O	A	O		I	O	C	I	I	I	I	I	I	I	I	I	I	I
Transportation controls	C, I	C,O	I	I		C	I	A	C	I	I	I	I	I	I	I	I	I
Emission charges	O	O	O	O	C		O	I	I	I	O	I	I	I	I	I	C	I
Transfer of emission source locations	A	C	A	C	I	O		I	I	I	C	C	I	I	C	I	I	I
Indirect source review	C, I	C	I	I	A	I	I		A	I	I	I	I	I	I	I	I	I
Environmental impact statements	I	A	I	I	C	I	I	A		I	I	I	I	I	I	I	I	A
									Emission control measures									
New source performance standards	C	C	A,O,C	I	I	I	I	I	I		I	I	I	I	C	I	C	I
More restrictive source emission limitations	C,O	C	C	I	I	O	C	I	I	I		C	I	I	I	I	C	I
Phase-out or prohibition of specified source categories	C	C	C	I	I	I	C	I	I	I	C		I	I	C	I	I	I
Fuel conversion	A	C	A	I	I	I	I	I	I	I	I	I		C	I	I	I	I
Energy conservation and utilization	C	C	C	I	I	I	I	I	I	I	I	I	C		A	I	I	I
Combination of emission sources	C	A	C	I	I	I	C	I	I	C	I	C	I	A		I	C	I
Special operating conditions	O	I	O	I	I	I	I	I	I	I	I	I	I	I	I		C	I
Stack height regulations	C	I	C	I	I	C	I	I	I	C	C	I	I	I	C	C		I
Control of fugitive dust sources	C	I	C	I	I	I	I	I	A	I	I	I	I	I	I	I	I	

LEGEND: A - MEASURES THAT ASSIST EACH OTHER IN MAINTAINING AIR QUALITY.
C - MEASURES THAT ARE COMPLEMENTARY IN MAINTAINING AIR QUALITY.
I - MEASURES THAT ARE INDEPENDENT OF EACH OTHER IN MAINTAINING AIR QUALITY.
O - MEASURES THAT MAY OVERLAP OR PREEMPT EACH OTHER IN MAINTAINING AIR QUALITY.

if estimates of emission reductions are made from countywide emission summaries, some further analysis--in the form of estimates of emission distribution within the county--of the location of the measure's impact is necessary.

5. Determine Compatibility of Measures

Many of the measures proposed for maintaining air quality standards are not completely independent of one another but have either beneficial or detrimental effects if they are implemented concurrently. It is important that these interactions be recognized when maintenance strategies are being formulated so that, if combinations of measures are necessary, those that are compatible can be supported and those that are not can be avoided.

The proposed procedure utilizes a matrix of all measures under consideration, such as shown in table V-2. Four symbols are used to qualitiatively describe the different relationships that may exist between two measures:

A The measures assist each other either by facilitating implementation or by increasing their combined effectiveness.

C The measures are complementary; they act on different sources or in a different manner to mutually produce combined improvements. One measure may be a component or instrument of the other.

I The measures are independent of each other; neither will enhance nor deter the effectiveness of the other.

O The measures have some overlapping in their emission reduction or location objectives, are competitive, may preempt each other, or be otherwise incompatible.

Theoretically, two measures could also be counterproductive to each other. However, none of the maintenance measures were observed to have this relationship, so it has been omitted.

The interrelationship between emission allocation and emission density zoning is an example of how one measure can assist in the implementation of another. Emission allocation prescribes the total allowable emissions in an area. Emission density zoning provides a means of implementation by distributing the allowable emissions throughout the area on the basis of land use. More restrictive source emission regulations and stack height regulations are examples of complementary measures. Implementation of the first results in a reduction of emissions, the second a spatial distribution of the reduced emissions. An example of measures that are independent of each other is found in the combination of Environmental Impact Statements (EIS) and New Source Performance Standards (NSPS). The EIS are applicable during the planning and preplanning stages, NSPS to the construction and implementation. Zoning approval and emission charges are examples of measures that may overlap or preempt each other. Zoning restrictions could prohibit the construction or modification of a source that, if built, would produce emissions subject to emission charges.

This approach to evaluation of interactions involves some subjective categorizations, but it provides a simple method of organizing the evaluation results for grouping of the measures. Some of the measures are so broad in scope and may interact in such complex manners that a single descriptive categorization may not be adequate. For example, a regional land-use plan could encourage high-density corridor developments in an urban area to increase mass transit usage and reduce VMT. In one AQMA, this may be interpreted as assisting transportation controls in maintaining standards, while in another it may be considered overlapping. The analysis of interrelationships should be made specifically for each AQMA based on local conditions. The results may be different from those shown in table V-2. In general, the same interactions will exist regardless of whether the two measures are being used for control of the same pollutant or for two different pollutants.

Although the following conclusion is not evident from the results of the matrix analysis, most of the land-use and planning measures (except the review procedures) represent comprehensive approaches to air quality maintenance and, as such, are mutually exclusive alternatives. The generalization can also be made that most of the emission control measures act independently of one another and, hence, can be applied simultaneously with additive effects. Moreover, the emission control measures can usually be implemented within the framework of different land-use and planning measures, and may be the specific actions taken to effect emission reductions that are needed under a land-use and planning measure.

In cases where implementation of a single maintenance measure involves several actions, e.g., transportation controls, an analogous matrix for intrameasure relationships should be developed, so that these are adequately considered in designating the actual actions to be implemented. The intrameasure interactions are highly dependent on local conditions, both in determining which individual controls are applicable and what the impacts are among them.

6. Develop Alternative Maintenance Strategies.

Maintenance may be demonstrated by several means:

a. Keeping emissions in problem areas below the total shown to be consistent with maintenance of the NAAQS (emission allocation approach);

b. Dispersion modeling of combinations of measures; or

c. A less quantified analysis based on an explanation of how the strategy is able to prevent standards from being exceeded, projecting and monitoring mechanisms included, and remedial actions available if standards are exceeded.

During this grouping and composition step, coordination with all participating agencies, other concerned agencies, and representatives of the public is especially critical. Agreement should be obtained on those measures to be eliminated from further consideration and the combinations of those remaining that appear most acceptable. In many cases, the screening process described here may reduce the number of feasible alternatives, and it is conceivable that it may clearly indicate the superiority of certain measures or strategies.

The proposed procedure for selection of appropriate measures should be carried through separately for each pollutant for which the AQMA has been designated. However, when interrelationships among measures for one pollutant are assessed, potential problems of implementing a single measure for different pollutants or different measures for each pollutant should be investigated. Also, as the alternative strategies for each pollutant are being composed, coordination of strategies for different pollutants is necessary.

C. SELECTION OF PREFERRED STRATEGY

Each air quality maintenance measure considered for inclusion in the strategy for air quality maintenance obviously has some beneficial effect. That is, the implementation of the measure necessarily must contribute to the prevention, reduction, or temporal and spatial dispersion of emissions. In addition, each maintenance measure will affect the community in a variety of ways that can be grouped as socioeconomic effects. These effects may be beneficial to one segment of the community and adverse to another, so that their overall contribution to the community is difficult to ascertain. In general, socioeconomic effects are difficult to quantify in precise terms, causing a corresponding difficulty in a mathematical evaluation of the comparative benefits or detriments of a variety of measures. However, the agency planning for air quality maintenance must be capable of performing such an evaluation before formulating its maintenance strategy.

The implementation of a maintenance strategy can result in a wide range of socioeconomic impacts. Because the individual measures comprising a maintenance strategy may interact with one another, it is difficult to isolate the impacts of specific measures. The problem is further compounded because the impact of an individual measure is influenced by the local conditions--socioeconomic environment--in which the measure will be implemented. Interactions and interrelationships between maintenance measures are discussed in previous paragraphs.

In the following paragraphs, some possible social and economic effects of maintenance measures are discussed and an overall procedure leading to an evaluation of these effects is suggested. While social effects may have severe economic consequences, and conversely, economic effects may have severe social consequences, these are discussed separately below; the possible interaction between the two categories, however, must not be ignored.

1. Social Effects

Social effects are the observable changes in social phenomena consequent to the implementation of a maintenance measure. Social effects are difficult to measure in quantitative terms. There is no generally accepted baseline against which the social impacts of interventions such as air quality maintenance measures can be evaluated. Social acceptability of any specific maintenance measure or set of measures can be determined by attitudinal surveys through interviews with those segments of the population likely to be affected. However, the time constraints on the development of a maintenance strategy for inclusion in the AQMP may limit the opportunity to use this approach. While public hearings or discussions of alternative measures could prove useful, care must be exercised to ensure that undue weight is not given to opinions of special interest groups.

Perhaps a more promising alternative is a survey of elected public officials. Politicians frequently stake their political lives on what they perceive to be the public desires. Therefore, they should be in a position to assess the social acceptability of proposed maintenance measures.

While it is highly desirable that social effects of maintenance measures be quantified, their complexity and current state-of-the-art make such quantification infeasible. In discussing the welfare costs of pollution, Dales states: "He [the economist] cannot measure welfare damages . . . all he has to offer, therefore, so far as antipollution policy is concerned, is a counsel of perfection" (ref. 1). This opinion is shared by Joseph L. Fisher who, as President of Resources for the Future, Inc., stated: "Goals and indicators with respect to the quality of the environment are difficult to conceive and more difficult to work with" (ref. 2). He adds that general indicators and goals are not only difficult to identify but are also not consistent over time in that they involve interpersonal, intertemporal, and interregional comparisons. He concluded that probably the basic indicator for social welfare would be one that deals with the net benefits that would result from selected and interrelated measures required for acceptable air quality. Net social benefits are benefits less costs or losses measured in some manner.

With respect to the methods by which net social benefits can be determined, Fisher implies that valid measurement techniques are not currently available. He views the creation of indicators on the trends of pollution and its effect on people as a task for social statisticians working with medical scientists; industrial, agricultural, and sanitary engineers; economists; sociologists; administrators and others.

It is significant to note that Fisher views evaluation of social impact in terms of trends. Many of the social indicators used in the study of urban areas are influenced by a wide variety of inputs. Because evaluation of these indicators in absolute terms provides no additional information for the evaluation of air quality measures, impact should be measured in terms of direction of change in the social indicators and by the relative effects of the different measures. This approach is among those recommended in a HUD-sponsored study for comparison of urban indicators (ref. 3).

By assessing the impact of each strategy upon each of the social indicators, and by local evaluation of the importance of these indicators, it is possible to achieve a ranking of the strategies in terms of their social effects. Two procedures for ranking strategies in terms of their social effects are presented in appendix B. The first of these is an approach developed by Albert J. Klee while he was with the Solid Waste Management Office, EPA (ref. 4). The second is a simplified procedure based on evaluation of the impact of maintenance strategies on the direction of change of social indicators. Klee's approach, or one of similar detail, is recommended. However, lack of time and personnel may preclude its use. In such a case, the more simplistic approach may be used.

2. Economic Effects

Each feasible alternative air quality maintenance strategy will provide the same benefits: the control of air pollution. Thus, the economic effects of alternative strategies can be assessed in terms of cost per unit of emissions prevented. Since these strategies typically will involve time periods of several years, the costs should be expressed in terms of present value. (The present value concept is simply an expression of the fact that a dollar today is worth more than a dollar at some future date, because today's dollar can be invested and earn interest).

The costs of air quality maintenance measures can be divided into direct and indirect costs. Whether the measure be a technological control--a device applied to an emission source, a production process change, a fuel switch, etc.--or an institutional control--a traffic control plan, emission density zoning, emissions allocations, etc.--direct costs can be estimated with considerable accuracy.

The direct costs include all expenditures required of a source, such as investment and operating costs for control equipment, incremental costs of fuel switching, costs of production process changes, emissions monitoring costs, administrative costs for accounting and reporting, costs of supervision of operating personnel, and costs required of the governmental unit for implementing a measure, such as operating costs for permit review programs, monitoring of air quality, reviews of source emission reports, and source surveillance. Indirect costs include the effects on sectors of the economy that are not required to respond to a particular maintenance measure, such as price changes for materials or products, costs associated with changes in behavioral patterns, and costs of increased solid waste and water pollution control.

Table V-3 lists the various cost elements and associated data sources that should be considered in assessing the economic effects of a particular maintenance measure. These cost elements and data sources are not considered to be all-inclusive, but rather are intended to serve as a guide for air quality maintenance planners. The list should be modified to meet the specific requirements of the AQMA and the political environment of the area. Table V-3 also shows, in matrix form, the costs elements that usually are applicable to the maintenance measures described in section B below.

The costs in table V-3 should be estimated for each time period for which the costs differ or for which the social impact changes. The appropriate factor(s) can then be applied to convert the costs to present value. It should be noted that the rate of return (interest rate) used in computing the present values of the strategies can affect the choice of stragegy. For this reason, the rate(s) used in comparing the strategies should be consistent with those used by State planning and budgeting offices. Furthermore, the local planning agency should clearly state the interest rate(s) used in their calculations. For an example see appendix C. Because the present value approach is widely accepted, the use of raw (undiscounted) cost figures is not appropriate.

3. Select Preferred Maintenance Strategy.

For each set of alternative maintenance measures (strategy),

Table V-3. Maintenance strategy cost elements and data sources

Costs borne by public agency, business firm, or consumer	Data source	Land use and planning measures									Emission control measures								
		A	B	C	D	E	F	G	H	I	A	B	C	D	E	F	G	H	I
		Emission Allocation Procedures	Regional Development Planning	Emission Density Zoning	Zoning Approvals and Other Indirect Regulatory Controls	Transportation Controls	Emission Charges	Transfer of Emission Source Location	Indirect Source Review	Environmental Impact Statements (EIS's)	New Source Performance Standards	More Stringent Control on Existing Sources	Phaseout or Prohibition of Emission Sources	Fuel Conversion	Energy Conservation and Utilization	Combination of Emission Sources (CES) Measure	Special Operation Conditions	Stack Height Regulations	Control of Fugitive Dust Sources
Public Agency and Business Costs																			
1. Purchase or rental of land, buildings	Dept. of public works			x		x		x			x	x		x					
2. Purchase or rental of equipment	Vendors	x		x		x	x	x			x	x	x	x	x	x	x		x
3. Financing costs	Banks	x		x		x	x	x			x	x	x	x	x	x	x		x
4. Equipment operation	Vendors	x		x		x	x	x			x	x	x	x	x	x	x		x
5. Equipment maintenance and repair	Vendors	x		x		x	x	x			x	x	x	x	x	x	x		x
6. Wages of personnel required by strategy	Personnel Dept.	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
7. Training of operatives, supervisors, clerical staff	Personnel Dept.	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
8. Facility and system design	City, County Eng.			x		x	x	x			x	x	x	x	x	x	x	x	x
9. Program planning	Planning Agency	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
10. Capital loss due to premature obsolescence	Bus. Consultant	x					x	x				x	x	x			x		
Public Agency Costs																			
11. Additional agency modelling and monitoring specific to strategy	Air Pollution Off.	x	x	x	x	x	x	x	x			x		x		x	x	x	x
12. Surveillance and record verification	Controller	x				x	x				x	x	x						
13. Change in tax revenue	Tax Dept.		x			x	x							x	x				
14. Change in receipt of fees or fares	Affected Dept.		x			x									x				
15. Subsidy payments to public or private enterprise	Budget Dept.		x			x	x							x	x				
16. Qualification and certification of facilities	Air Pollution Off.					x								x	x	x			
17. Change in public expenditures from general revenues	Budget Dept.		x	x	x	x				x									
18. Interagency coordination	Dept. of Admin.	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Business Costs																			
19. Emission charges	*						x												
20. Special taxes on business capital or operations	Tax Dept.		x			x													
21. Additional industry location costs	Planning Off.	x	x	x	x	x		x				x	x						
22. Land appreciation and tax payments	Tax Dept.		x	x	x							x							
Consumer Costs																			
23. Change in fuel consumption and/or price	*					x								x	x				
24. Auto operation costs	*					x													
25. Increased prices and fees	*					x	x				x	x	x	x					
Indirect Costs																			
26. Driver inconvenience, time and travel cost	*					x													
27. Profit loss for firms not directly affected	*		x	x		x	x	x			x	x	x	x			x		
28. Indirect effects on resource and product prices	*	x	x	x	x	x	x	x			x	x	x	x	x	x	x	x	x

*Items normally estimated by staff preparing AQMA plans.

anticipated beneficial or adverse social and economic effects must be identified and evaluated as described in sections 1 and 2, above; quantitatively insofar as possible, or qualitatively in sufficient detail to allow for comparison with the effects of other strategies. In general, economic effects and costs are quantifiable in terms of today's dollars; social effects can be expressed quantitatively in comparison with themselves, based upon the trend changes caused by the alternative strategies.

Assessment of the socioeconomic impact of individual maintenance strategies can be accomplished as follows:

a. Determine the economic costs for each measure by calculating the present value of the costs associated with each measure. Sources of these data are indicated in table V-3.

b. Summarize impact of each measure comprising the strategy in terms of emission reduction or redistribution from results of the screening analysis. For some measures, quantification of the impact may not be possible. Whenever feasible, information should be made based on local experience and judgment. As a minimum, a qualitative evaluation of the measure's effectiveness should be made.

c. For those measures for which impact was quantified, determine cost per unit of emissions reduced or redistributed.

d. Determine the rankings and evaluation scores of the social impact of the strategies using the procedure described in appendix B. Otherwise, enter the rankings based upon subjective judgment.

e. Prepare a summary sheet for each feasible maintenance strategy being carried forward for consideration. A suggested format for this summary is shown in figure V-2. A summary should be prepared for the entire AQMA and those portions thereof that are receiving special attention because of a localized pollution situation.

f. Compare economic and social impacts of the strategies under consideration and select the strategy of choice. From an economic point of view, the selection can be made by comparing the total present value of costs. Evaluation from a social viewpoint becomes subjective, and requires the exercise of considerable judgment. For example, Area of AQMA where inapplicable ____________

Pollutant ____________ Reduction or redistribution required ____________

Measure	Applicable (yes or no)	Sources affected	Emissions reduced or redistributed (tons)	Economic cost ($)	Cost $/ton	Social impact number of*		
						+	0	-
Land Use and Planning								
1. Emission allocation								
2. Regional development planning								
3. Emission density zoning								
4. Zoning approval								
5. Transportation control								
6. Emission charges								
7. Transfer of emission source location								
8. Indirect source review								
9. Environmental impact statements								
Emission Control								
1. New Source Performance Standards								
2. More stringent control on existing sources								
3. Phase out on prohibition								
4. Fuel conversion								
5. Fuel conservation and utilization								
6. Combination of sources								
7. Special operating conditions								
8. Stack height regulations								
9. Control of fugitive dust								
Totals								

*To be used if short approach is used.

Cost base year:

Total discounted Cost ($):

Emissions Reduced or Redistributed (tons):

Avg. Cost/ton:

Social Evaluation Score:

Rank:

Combined Socioeconomic Rank of Strategy:

(Specific remarks or comments on individual measures or the overall strategy should be appended)

Figure V-2. Suggested format for maintenance strategy summary

consider a situation wherein two maintenance strategies are being compared, one of which is favored from economic considerations, the other from social. Final decision requires equating increased costs and increased social benefits. This judgment can probably best be made by the governing bodies of the political jurisdictions concerned.

Analyses of impact of maintenance strategies is further complicated by the possibility that short-term and long-term impacts could differ significantly. For example, the imposition of more stringent controls on existing sources could result in reduction of emissions in the immediate future while at the same time discourage the long-term growth of the affected source category. Thus, the short-term impacts are direct while the long-term are indirect and occur as the result of interaction between the direct impacts and the socioeconomic environment. Again, judgment will have to be exercised to assess the value of short-term over long-term benefits.

g. Document the selection decision. The summary table should be submitted in the AQMP, and supporting data and a description of the socioeconomic analysis should be available for public hearing and retained for possible inspection by the Administrator.

REFERENCES

1. J. H. Dales. Pollutions Property & Prices. Toronto: University of Toronto Press, 1968.
2. J. L. Fisher. "The Natural Environment." The Annals of The American Academy of Political Social Sciences 371 (May 1967).
3. M. J. Flax. A Study in Composition Urban Indicators: Conditions in 19 Large Metropolitan Areas, The Urban Institute, Washington, D.C., for the Department of Health, Education, and Welfare, April 1972.
4. A. J. Klee. "The Role of Decision Models in the Evaluation of Competing Environmental Health Alternatives." Management Science (Journal of the Institute of Management Sciences), Vol. 18, Number 2, October 1971.

Chapter VI: AQMP ASSEMBLY

A. INTRODUCTION

After the AQMA analysis and maintenance strategy development have been completed, the information should be organized into an AQMP. The following is a suggested format for the plan. The final format will be specified in a revision to 40 CFR 51. This format consists of an introduction, a documentation section, and a section in which the information about each of the AQMA's within the State is summarized. If another format is used, an explanation of the rationale for using it should be included in the introductory section of the AQMP.

In addition to the tables and charts recommended in the following format, tables and worksheets described in other chapters of this volume or in other EPA guidelines documents should be included in the AQMP if they improve the clarity of the presentation.

B. AQMP FORMAT

1. Introduction

a. Background. A general description of the plan and why it is required.

b. Designation of AQMA's. A list of each AQMA and its associated pollutants (see figure VI-1).* For each AQMA indicate the following: whether the AQMA is an interstate or intrastate area; the cities, counties or political jurisdictional areas within the AQMA; the pollutants for which the AQMA is designated; and the conclusions

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*Figures VI-1 through VI-6 illustrate suggested formats for the presentation of summarized data. These formats are tentative and may be changed when 40 CFR 51 is revised. Whatever format is used, complete data (as opposed to summarized data) shall be retained by the State for inspection by the Administrator, if required.

AQMA's designated by EPA

AQMA	Interstate	Political jurisdictions included	Pollutants	Recommended action
1.				
2.				
3.				

Figure VI-1. An example format for identifying AQMA's, jurisdictions involved, pollutants of concern, and recommended action.

based on analysis of the AQMA, e.g., no plan is needed, or a strategy has been developed.

c. Plan Contents. A list of documents that constitute the plan with each document or portion thereof identified according to its respective pollutant and AQMA.

d. SIP Changes. A list of any documents or portions of the SIP as it exists immediately prior to the submission of the AQMP that are being revised, rescinded, or supplemented by the AQMP, and a brief description of each change. This information should be presented in the same order as the sections of 40 CFR 51.

e. Plan Review. Present a timetable for performing reviews in 1980 and 1985 of AQMA designations, and of the effectiveness of the AQMP in preserving air quality during the intervening periods.

2. Documentation

a. Legal Authority. A demonstration of the legal authority to adopt and implement the AQMP, pursuant to 40 CFR 51.11, including a timetable for obtaining any needed authority. Legal authority for each measure comprising the maintenance strategy must be included.

b. Public Hearings. A certification of public hearings pursuant to 40 CFR 51.4(d).

c. Intergovernmental Cooperation. Evidence that intergovernmental cooperation required by CFR 51.21(a) was accomplished, that the cooperation required by 40 CFR 51.21(c) will occur, and that the provisions of 40 CFR 51.10(d) relating to the interstate transmission of pollutants will be followed. Figure VI-2 illustrates an example format for summarizing the agencies and their involvement in the AQMP implementation. For each task within the AQMP, list all participating agencies and the jurisdictional areas they represent. Also indicate whether the agencies reviewed and commented on the plan, and name the people in each of the agencies responsible for completing the AQMP tasks. In the last column of the suggested table, the supporting documentation indicating agency acceptance of or agreement with the assignment should be identified by reference.

States should provide evidence that State, regional, and municipal clearinghouses designated pursuant to OMB Circular A-95 have reviewed

Summary of agency responsibility for AQMP implementation

AQMP task	Coordinating agencies	Jurisdictional area	Reviewed or commented on AQMP	Task assigned to

Figure VI-2: An example format for summarizing agency involvement in AQMP implementation.

and commented on the plan, and that the comments were taken into consideration. Comments from these clearinghouses should be included in this section of the AQMP. Agreements signed by responsible authorities pertaining to tasks to be performed by governmental agencies as a part of the AQMP implementation must be included with the plan presentation.

d. Resources. A description of resources available to and needed by State and local agencies to implement the entire SIP during the ensuing 10-year period, pursuant to 40 CFR 51.20 (see figures VI-3 and VI-4). For each AQMA, summarize the level of effort, in man-years, required through 1985 by the agencies responsible for implementing the AQMP. In addition, summarize the funding requirements for implementing the AQMP through 1985. The dollar values used for these estimates may be current (1975) values or discounted values, depending on budgeting practices within the State. However, the dollar values used must be identified.

3. AQMA's

For each AQMA published by EPA pursuant to 40 CFR 51.2(f), and for each pollutant associated with that AQMA, emission and subsequent air quality should be projected through 1985.

a. AQMA Analysis. If data on emissions and air quality, other than those obtained from NEDS and SAROAD, are used in the AQMA analysis, a statement describing the data base should be included in the AQMP. These data must be entered into the NEDS or SAROAD system at the next semiannual update. Using these data as a base, the following steps should be undertaken:

1) Project emissions to 1975/77, or to compliance date.

2) Project growth and development to 1980 and 1985, by source category. Document the rationale for the projections.

3) Project emissions and air quality to 1980 and 1985, together with the rationale for the projections.

4) Quantify difference between projected (1980 and 1985) emissions and NAAQS, in terms of required emission reductions.

For each pollutant in each AQMA, summarize the analysis (fig. VI-5). Show the current (baseline) emissions, emissions at attainment of the

Summary of resources: Man-year estimates by function and agency distribution for the years 1975, 1980, 1985

	Year								
Function	1975			1980			1985		
	State	Region	Local	State	Region	Local	State	Region	Local
Enforcement									
Engineering									
Technical services									
Management									
Totals									

Note: For each function, list estimated labor requirements for each State, regional, or local agency involved. Provide an alphabetical code for the agencies starting with "A" for the State air quality control agency. The entry for that agency for 1975 might appear, for example, as A-6.

Figure VI-3. Suggested format for providing estimates of labor requirements, by agency, for three key years.

Summary of resources: Funding estimates* by function

Function	Year								
	1975			1980			1985		
	State	Region	Local	State	Region	Local	State	Region	Local
Enforcement:									
Operating funds									
Capital funds									
Contract funds									
Engineering									
Technical services									
Management									
Total operating funds									
Total capital funds									
Total contract funds									
Total funds									

*1975 dollars (or 1975, discounted 1980, and discounted 1985 dollars)

Note: For each function, list estimated dollar requirements for each State, regional, or local agency involved. Use the same agency coding as used for preparing labor requirement estimates.

Figure VI-4. Suggested format for the presentation of funding required for years beginning June 1975, June 1980 and June 1985. (Note that dollar values may be current (1975) or may be discounted, but the values used must be indicated.)

Summary of AQMA analysis: (pollutant)

Source category	Baseline emissions	Emissions at attainment	Percent control applied	Percent control remaining	Growth factors	1980 Emissions	1985 Emissions
Fuel combustion:							
Point							
Area							
Industrial processes:							
Chemical manufacturing							
Food/agriculture							
Primary metals							
Secondary metals							
Mineral products							
Petroleum industry							
Wool products							
Evaporation							
Metal fabrication							
Leather products							
Textiles							
Inprocess fuel							
Other							
Transportation							
Solid waste disposal:							
Point							
Area							
Miscellaneous							
Point							
Area							

Note: The source categories are included as examples only. They should be further disaggregated depending on the level of analysis used as described in volume 7 of this guideline series.

Figure VI-5. Suggested format for summarizing in broad categories the results of the AQMA analysis. A separate table is required for each pollutant.

NAAQS, the percent control to be applied by the attainment date, a reasonable estimate of the additional control that could be applied, and the growth factors and projected emissions for 1980 and 1985.

Details of this analysis, such as those resulting from the procedures outlined in *Guidelines for Air Quality Maintenance*, vol. 7, *Projecting County Emissions*, shall be retained by the State for examination by the Administrator, if required.

In the event that the detailed analysis of each pollutant within each AQMA results in the conclusion that the NAAQS will not be exceeded through 1985, the plan document need include only the information in sections B.1.a, B.1.b, and B.3.a., above.

b. *Maintenance Strategies*. For each AQMA for which air quality will exceed the NAAQS by 1985, alternative strategies for maintaining standards should be developed. The strategies will be composed of maintenance measures, each of which must be evaluated on the basis of its effectiveness and its associated economic and social cost. A summary of the analysis of alternative maintenance strategies should be included in the AQMP (see fig. VI-6).

For each maintenance strategy considered, show the maintenance measures that are included, their cost in dollars, and an estimate of the social impact. Also explain why a strategy was or was not selected.

C. STATE REVIEW OF THE AQMP

The internal organization created to ensure coordination and cooperation during the development and implementation of the AQMP is probably the best group to properly review the draft of the plan. Such a review is essential if all of the State and local agencies having responsibilities for implementing the AQMP are to work together. Changes in the AQMP draft would be made in accordance with the comments and suggestions received from the internal review.

D. PUBLIC HEARINGS

The proposed maintenance plan should be made available to the public, and announcement of public hearings on the AQMP should be made at least 1 month prior to the hearing date. In order to meet the prescribed deadline, the hearing should be held by May 15, 1975.

Summary of strategy evaluation: (pollutant)

Strategy	Maintenance measures	Cost($)	Social acceptance	Remarks

Figure VI-6. Suggested format for summarizing strategy evaluations. The remarks column should be used to explain the basis for acceptance or rejection of the strategy. A separate table is required for each pollutant.

The requirements of 40 CFR 51.4 are applicable to the submission of the AQMP. As a minimum, States must conduct public hearings and provide for public availability of the plan in each AQMA that has been designated in the State. Regional and local agencies that participated in the preparation of the plan or that have been assigned a role or responsibility in the implementation are to be included in the notification list.

E. REVISING, ADOPTING, AND SUBMITTING THE AQMP

After consideration of oral and written public comments, the States must formally adopt the plan using procedures similar to those used in the adoption of the SIP. The requirements of 40 CFR 51.5 are applicable to the submission of the AQMP to the Administrator, EPA. Submission to the Administrator shall be accomplished by the delivery of five copies of the plan to the appropriate Regional Office. Plans must be submitted by the Governor not later than June 18, 1975.

Chapter VII: BIBLIOGRAPHY

ENERGY CONSERVATION

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This study deals with the changing awareness and current practices in promoting environmental quality through urban planning and controls in local and metropolitan planning agencies. It contains the results of a national survey of urban and regional planning agencies. Reviews the most promising approaches to land-use and comprehensive planning, planning and controls for the water resources-land use interface, urban design and controls, and residuals management. Presents concept of land-use guidance planning.

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This article describes municipal and environmental problems created by the rapid growth of the suburban community of Petaluma, Calif., and the controlled-development program undertaken to combat these problems.

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This study investigated different development patterns for the Hartford area and modeled the expected air qualities for the alternative patterns. Conclusions were drawn as to most desirable land-use plans from an air quality standpoint.

Appendix A: FUNCTIONAL PROGRAMS

This appendix discusses existing programs that are related to air quality maintenance through their land-use or transportation dimension. Land-use and transportation considerations are described in detail in Guidelines for Air Quality Maintenance and Planning, Vol. 4, Land Use and Transportation Considerations. These programs can be divided into environmental programs and those programs that have a strong land-use planning function. The environmental programs are generally focused on environmental protection and are single purpose; each is concerned with the control of a specific environmental problem. For the most part, these two types of programs have evolved independently at all levels of government.

For completeness and continuity, a brief description of air pollution programs is given in paragraph A.1 below. Although these programs have land-use and growth dimensions, they are not primarily concerned with the long-range effects of population and industrial growth. In preparing an AQMP then, air programs must be viewed in the context of possible land-use and transportation strategies, and conversely. An important example is that greater control by those strategies listed in paragraph A.1 could allow greater leeway in growth.

A. ENVIRONMENTAL PROGRAMS

1. Air Programs

a. State Implementation Plans (SIP). The designation of Air Quality Control Regions (AQCR's) by the 1967 amendments to the Clean Air Act initiated the concept of coordinated State and local action to control air pollution to thereby achieve air quality standards. Under the 1967 amendments, the Federal role in the SIP process was limited to the designation of AQCR's, issuance of criteria and control-technology documents, review of State-adopted ambient standards, and review of adopted SIP's. The 1970 amendments to the Clean Air Act expanded the Federal role in the SIP process by requiring that AQCR's be designated for the Nation's entire land area and that SIP's be prepared to meet newly authorized National Ambient

Air Quality Standards (NAAQS) for the criteria pollutants--particulate matter, sulfur oxides, oxidants, carbon monoxide, nitrogen dioxide, and hydrocarbons. The amendments also established statutory deadlines for the submission of SIP's and mandated EPA to propose plans in those situations where the State plan was inadequate. A statutory deadline was established for Federal promulgation of such plans if the State did not take appropriate corrective action. The regulations to facilitate SIP development, submission, and review that were promulgated on August 14, 1971, (ref. 1) required the development of control strategy(ies) that, in addition to resulting in the aggregate reduction in emissions required to attain the NAAQS, would also maintain them. Measures and procedures that could be included in the SIP were:

- Stationary Source Review
- New Source Performance Standards (NSPS)
- Federal Motor Vehicle Control Program (FMVCP)
- Transportation Controls
- Indirect Source Review, added by amendment on June 18, 1973 (ref. 2).

b. Stationary Source Review. Stationary source review procedures discussed in this paragraph are applicable to the review of existing sources to determine current status of compliance with applicable State and local regulations, and the review of new or modified sources, not covered by NSPS, to set compliance schedules and emission limitations. The review of new and modified sources for which NSPS have been promulgated is covered in subparagraph c, below.

1) Existing sources. Review of existing sources consists of surveillance to determine status of compliance with applicable regulations. Owners and operators of stationary sources are required to install, maintain, and use control equipment, or employ such measures as are required to attain and maintain NAAQS. Additionally, owner/operators are required to install, maintain, and use monitoring equipment to determine the effectiveness of control equipment or measures.

The State agency is required to establish a system of scheduled inspections for major stationary sources. The SIP must specify the sources expected to be inspected periodically. This, incidentally, provides a source of information on major emitters in an AQMA for use in air quality maintenance planning. The purposes of the periodic inspection of stationary sources include but are not necessarily limited to:

- Inventory and register of sources of air pollution
- Determination of compliance with the permit system
- Check of compliance with conditions of variances
- Inspection of monitoring devices and a check of monitoring records for accuracy
- Sample of fuels, raw materials, air contaminants, etc.; e.g., sample of fuels if control strategy includes sulfur limitations.

Thus, it can be seen that stationary source review is a part of the enforcement program. It can also serve as a source of information and experience that can be used as input to SIP revision and air quality maintenance planning.

2) New and modified sources. States are required by 40 CFR 51.18 to establish procedures that will enable the State or local air pollution control agency to determine whether the construction or modification of a facility, building, structure, installation, or combination thereof will result in violation of the SIP control strategy or interfere with the attainment or maintenance of NAAQS. The primary purpose of this review is to set compliance schedules and emission limitations. Following are potential responsibility modes for accomplishing this review:

- State agency responsible for review of all sources throughout the State
- State agency responsible for review of certain large sources, and Regional agency composed of local agencies responsible for others
- Regional and local agencies responsible for review of all sources.

Obviously, other arrangements are possible. The approach used must provide for a review of all new and modified sources. The State agency retains ultimate responsibility for this review.

Review of new and modified sources is accomplished through permit or other system by which the owner/operator submits such information as:

- The nature and amounts of emissions to be emitted
- Location, design, construction, and operation information as may be necessary to permit the State or local agency to make determination as to compliance with the appropriate control strategy and the impact on NAAQS.

Upon the receipt of this information, the agency having review responsibility approves or disapproves the proposed construction or modification. Approval of the proposed construction or modification does not absolve the owner/operator from the responsibility for compliance with applicable State and local regulations. This compliance is policed through the procedures described in subparagraph 1, above.

c. New Source Performance Standards. Section 111 of the Clean Air Act authorizes the EPA Administrator to establish national standards of performance for new or modified stationary sources of air pollution. Stationary sources are defined as any building, structure, facility, or installation that emits any air pollutant. Modification is defined as any physical change in, or change in method of operation of, a stationary source that increases the amount of any air pollutant emitted by the source or results in the emission of any air pollutant not previously emitted. Increase in production up to the design capacity of an installation is not considered to be a modification and is therefore not subject to NSPS.

While NSPS also can be promulgated for noncriteria pollutants, only those pertaining to criteria pollutants are applicable, at this time, to air quality maintenance.

NSPS are designed to prevent new air pollution problems instead of having to correct problems after they surface. Under NSPS, best demonstrated technology is required for new and modified plants, thereby reducing the impact of rapidly growing industries and of plant or process modifications that would result in increased emissions. Because air quality maintenance problems are the result of growth, NSPS should play an important role in the air quality maintenance strategy.

Owner/operators of new or modified sources for which NSPS have been promulgated are required to notify EPA of the anticipated and actual date of initial startup. Within 60 days after achieving the maximum production rate at which the facility will be operated, the owner/operator is required to conduct performance tests and submit the results to the Administrator.

States may be delegated authority to apply and enforce NSPS under the provision of section 111 (c) (1) of the Clean Air Act by submitting an approvable procedure for implementing and enforcing NSPS for new sources within the State. The States also have the option of adopting the emissions requirements of the NSPS, or more stringent ones, as part of their regulations. In such a case owner/operators of new and modified sources within the State under the latter option are required to comply with the Federal requirements for NSPS as well as State regulations.

d. The Federal Motor Vehicle Control Program (FMVCP). The FMVCP establishes emission criteria for HC, CO, and NO_x that must be met by all new motor vehicles. Since the 1968 model year, automobile manufacturers have been required to ensure that automobiles produced during a given model year will result in the required emission control and that the selected control systems will be reasonably durable over the life of the vehicle. This assurance is achieved through the testing of a specified test fleet by the manufacturer in conjunction with verification of test results by EPA and subsequent certification of vehicles that meet the Federal standards. The Clean Air Act also authorizes EPA to test vehicles coming off the assembly line beginning with the 1975 model year.

The FMVCP is expected to result in substantial reductions in nationwide emissions of HC, CO, and NO_x. A portion of this reduction results from the elimination of older vehicles from the national motor vehicle fleet. The other portion is attributable to the increased control capability of new models. Inspection/maintenance programs are essential to ensure that these control systems are properly operated and maintained so that emission standards are achieved by in-use vehicles.

e. Transportation Control Measures. "Transportation controls" is the generic term applied to a diverse group of measures that, either directly or indirectly, have the potential of reducing emissions from motor vehicles through either one of two broad mechanisms:

- Reduction of the emission rate per vehicle-miles of travel (VMT)
- Reduction in the total number of VMT.

Transportation controls also can include certain stationary source control measures such as service station vapor controls as part of the overall control strategy for hydrocarbons and oxidants. Transportation controls are necessary to bridge the gap between technology and the attainment of NAAQS in those areas where the reduction of emissions from FMVCP are not sufficient to ensure the attainment and maintenance of NAAQS.

Transportaton control plans developed to date have been designed to attain standards over the relatively short-term range of 2 to 5 years. These plans have generally employed measures aimed at both emission rate and VMT reductions. However, for the maintenance of standards over the longer range, measures that reduce emissions from in-use vehicles will become progressively less effective unless new control or vehicle-power technology breakthroughs occur. Retrofit and inspection/maintenance have only a minor impact on emissions from vehicles that meet the 1977 Federal emission standards. As a result transportation control strategies for the maintenance of air quality will most likely rely heavily on measures that reduce VMT. Probably, the most promising transportation control for producing lasting and significant reduction in automotive emissions is greater use of mass transit or other means of increasing passenger load per VMT. Cities that provide high quality mass transit have demonstrated that this mode of travel can attract a high percentage of the travelers, especially when combined with measures that make individual automobile usage comparatively difficult or expensive.

f. Indirect Source Review. Requirements (currently undergoing revision) for indirect source review were added to the provisions of 40 CFR 52 in February 1974 (ref. 3). Indirect source review requirements were introduced specifically for ensuring the maintenance of national standards by reducing the automobile-related pollutants resulting from the attraction of mobile source activity to any facility, building, structure, or installation. This maintenance measure is implemented through the review of applications submitted by the owner or operator of any proposed new indirect source. Federal regulations require review of indirect sources shown in table A-1. These requirements are applicable to States that lack indirect source regulations. Some States with approved plans may have different requirements. Indirect source review is directed primarily toward carbon monoxide emissions. However, airports and major highways are also reviewed for their impact on areawide oxidant levels. On a microscale, indirect source review alone should be effective in preventing the carbon monoxide standards from being exceeded as a result of motor vehicle emissions. Its impact on carbon monoxide levels is best described as "peak-shaving"; i.e., it acts to limit concentrations in potential hot spots, or isolated areas of high traffic density.

A significant feature of the Federal Regulations governing indirect source review is the changes that authorize delegation of review authority to other than an air pollution control agency or activity. Such delegation can be made to a State agency other than the air pollution control activity, or to appropriate units of local government. Appropriate EPA guidance on delegation will be forthcoming.

2. Water Planning and Control

Water resources management is one of the earliest governmental natural resource programs, dating back to the delegation of responsibility for development and maintenance of rivers and harbors for navigation. The specific areas of interest are covered by sections 201, 208, 303, and 402 of the Federal Water Pollution Control Act amendments of 1972 (Public Law 92-500).

a. Background and Purpose of the Legislation. Sections 303, 208, and 201 suggest a nested planning sequence based on

Table A-1. Indirect sources requiring approval

Location	Sources	Minimum size for review of impact of carbon monoxide air quality standards	Minimum size for review of impact on photochemical oxidant and nitrogen oxides air quality standards
Urban area (SMSA)	New roads and highways	20,000 vehicles per day (average)	50,000 vehicles per day (average)
	Modified roads and highways	10,000 vehicles per day over existing traffic (average)	25,000 vehicles per day over existing traffic (average)
	New airports	50,000 operations or 1.6 million passengers per year	50,000 operations or 1.6 million passengers per year
	Modified airports	50,000 operations per year increase over existing level, or increase of 1.6 million passengers per year	50,000 operations per year increase over existing level, or increase of 1.6 million passengers per year
	Other indirect sources, new	Parking for 1,000 cars or more	No analysis required
	Other indirect sources, modified	Parking for 500 cars or more over existing number	No analysis required
Nonurban area	Airports	Same as in urban areas	Same as in urban areas
	Other indirect sources, new	Parking for 2,000 cars of more	No analysis required
	Other indirect sources, modified	Parking for 1,000 cars or more over existing number	No analysis required

Source: 40 CFR 52.22 (b) (2), (February 25, 1974).

geographical area proceeding from river basin planning to sewage treatment plant construction in conformance with basin plans. These sections are discussed in the order of decreasing areal extent.

1) Section 303. Section 303 requires continuing basinwide water pollution control planning and provides a framework for all other pollution control activities so as to meet water quality standards. Basinwide plans are prepared by the State and must be updated yearly.

Basin plans must include among other elements:

- An assessment of total maximum daily pollutant loads for streams,
- An assessment of nonpoint pollution sources and, where applicable, needed control measures,
- An inventory of significant individual dischargers,
- Compliance schedules for abatement of significant discharges.

A method of coordinating water quality management planning with related State and local comprehensive and functional project planning activities, including land-use and other natural resources planning activities, must be provided.

Stream segments in a basin must be classified according to the current and expected water quality. In this classification, consideration must be given to anticipated economic and demographic growth over at least a 5-year period. Consideration should be given to economic and demographic projections utilized by other State programs.

Essentially, 303 plans constitute the framework within which 208 plans designed for specific portions of a basin with complex pollution control problems are developed.

2) Section 208. Section 208 provides for the designation of certain portions of a water basin as requiring areawide waste treatment management. These are areas having a water quality control problem that cannot be alleviated without an areawide approach aimed at integrating controls over municipal and industrial waste water, storm sewer runoff, nonpoint source pollutants, land use, and growth.

Areas requiring 208 planning may be designated by the Governor or by the chief elected officials of general local purpose government in the area.

Section 208 plans must be certified annually by the Governor as being consistent with applicable basin plans and as being incorporated in the State Continuing Planning Process of section 303.

Section 208 plans must comply with solid waste disposal guidelines.

3) Section 201. Section 201 is concerned with the planning and construction of municipal waste water treatment works. Planning under this section consists of facilities planning for the area and must be consistent with the areawide waste treatment management plans required by section 208.

Section 201 also requires that waste treatment management include "control or treatment of all point and nonpoint sources of pollution...."

No construction grant assistance may be awarded within a 208 planning area with an approved plan unless the project is included in the 208 plan.

4) Section 402. Section 402 deals with the implementation of a permitting system for pollutant discharges. It is an implementation tool of the 208 and 303 plans. No permits may be issued for point sources in conflict with the 208 plan.

Local planning and management to provide for growth effects on waste loads can be required in municipal permits.

b. Institutional Responsibilities. State agencies responsible for 303 planning have been designated by the Governors. Local or interstate agencies may be designated to conduct all or part of the planning within each basin.

The 208 planning agency must be a representative organization whose membership includes, but is not limited to, elected officials of local governments having jurisdiction in the planning area. Typically, A-95 review agencies and COG's have been designated.

Agencies involved in 201 planning are typically municipal single purpose districts--sewer and water departments. Water permits issued under section 402 are issued either by the State water pollution control agency or by EPA.

c. Effective Time Schedules. States must comply with the section 303 continuing planning process by June 30, 1975. February 3, 1974, was the deadline for the initial designation of areas subject to 208 planning.

d. Interfaces with Air Quality. AQMP's and 208, 303, and 402 plans involve projections of land use and land activity. Growth projections prepared for SIP's, and therefore, AQMP's, must be consistent with growth projections prepared for these water plans.

Agencies designated for 208 planning may also be the agencies involved in air quality maintenance. If not, the local 208 planning agency can serve as a valuable source of technical planning talent, information and knowledge of local land-use and transportation programs.

Water plan implementation affects air quality indirectly. Construction or extension of sewer treatment facilities may induce growth that, in turn, may increase point and areawide emissions. Direct effects such as sludge incineration are subordinate to the indirect effects.

Waste water treatment facility permit conditioning, water planning and construction, grant application guidelines, EIS preparation requirements, and modification of the indirect source review procedure in SIP's may limit the size and capacity of waste water treatment capacity in the interest of air quality attainment or maintenance.

e. Special Considerations and Problems. Land-use relations to water quality are required in the development of plans under sections 303, 208, and 201. Concepts and approaches developed in such water planning/land-use analysis may be of interest to air quality maintenance activities that must relate air quality and land use. Also, 208 planning agencies should be aware of the wide variety of land-use controls that may be applicable in an area.

3. Solid Waste

a. Background and Purpose of the Legislation. The Solid Waste Disposal Act as amended (P. L. 91-512) is directed primarily at the loss of natural resources represented by solid waste. This act authorizes a research and development program to promote the demonstration, construction, and application of solid waste management and resource recovery systems. Financial and technical assistance is also provided to States and local governments for planning and developing resource recovery and solid waste disposal programs.

Authority to regulate or promote land-use planning as a solid waste management strategy is limited to Federal facilities and to contingency agreements exacted through Federal grant programs (ref. 4). EIS's are required on proposed Federal activities.

Planning and demonstration grants to States, contingent on their abandoning open burning and dumping and developing comprehensive solid waste plans, are available from EPA. Otherwise, EPA has no authority to close open dumps, override local zoning, or establish solid waste facilities where communities fail to do so.

Open burning can be controlled through Clean Air Act regulations and dumping in surface water can be controlled through the Refuse Act of 1899.

b. Institutional Responsibilities. Solid waste activities at the State level will generally be the responsibility of the State health or environmental agency.

At the county level, responsibility for solid waste activities usually resides with the county or regional health office. Activities consist of enforcing State solid waste regulations.

At the city level, solid waste activities are those of collection and disposal and are usually performed by the department of public works or sanitation department.

c. Effective Time Schedules. None.

d. Interfaces with Air Quality. Solid waste disposal may contribute to air pollution; e.g., incineration. However, the most important interaction is probably the increased amount of solid waste that may be generated as a result of air pollution control techniques. Byproducts of these techniques, such as limestone from scrubbers, could contribute extensively to the solid waste load of a metropolitan area. The air quality planner must be aware of the impact of such solid waste on sanitary land fills.

e. Special Considerations and Problems. Initial draft guidelines for areawide waste management planning require 208 planning agencies to comply with solid waste disposal guidelines (40 CFR 204, 205, 207, 208, and 241).

4. Other Environmental Programs.

Certain other programs and activities concerned with environmental protection or presentation may have a growth dimension. One of these is noise abatement programs, particularly at airports. The Department of Housing and Urban Development has guidelines for evaluating site exposure to aircraft and has formulated a comprehensive airport planning methodology. Certain land-use and land activities, such as open air theaters, schools, and hospitals, are not consistent with high noise levels. EPA will be proposing to the Federal Aviation Administration regulations for the control of noise at and around airports. These regulations will provide for land-use controls where appropriate.

Many city programs have land-use dimensions, both at the planning and the implementation stage. These city programs generally have control mechanisms that the air quality maintenance agency should be aware of. Examples of the types of activities and land-use controls covered by these programs are:

- Zoning
- Flood plain zoning and management
- Recreational parks
- Greenbelts
- Performance standards
- Subdivision regulations
- Planned Unit Development regulations
- Buffer zones
- Easements, especially coordination easements
- Housing and premises codes
- Building codes
- Hillside development regulations
- Grading regulations
- Taxation policies.

Such land-use activities and controls form an overall framework within which air quality maintenance strategies with land-use dimensions must be evaluated.

Many local governments have initiated and implemented air pollution control activities that would exist even in the absence of Federal requirements. Some of these programs predate the Federal requirements for such activities. Other cover noncriteria pollutants to cope with problems specific to the area. The air quality maintenance planner should familiarize himself with these programs and consider using the existing local air pollution control structure for implementation of that part of the AQMP within the local government's jurisdiction. Such action takes advantage of the already existing expertise and knowledge as well as already established and legally enforceable enforcement power.

B. TRANSPORTATION

1. Background and Purpose of the Legislation

United States Code, Title 23, section 109(j) requires that the Secretary of the U.S. Department of Transportation (DOT) issue guidelines to ensure that highways are constructed consistent with any approved plan for the implementation of ambient air quality standards (ref. 5).

The Federal Highway Administration has specified that for any proposed project on a Federal Aid System, final decisions on the project shall take into consideration the costs of eliminating or minimizing air pollution. The guidelines require that:

- Environmental effects be identified and studied early enough to permit analysis and consideration while alternatives are being formulated and evaluated,
- Other agencies and the public be involved in project development early enough to influence technical studies and final decisions, and
- Appropriate consideration be given to reasonable alternatives, including the alternative of not building the project.

These guidelines apply to all Federal Aid System projects in the stages of system planning, route location, and highway design. They also apply to planning decisions made in the urban transportation planning process for urbanized areas of over 50,000 population. The 3C planning process--referring to the continuing, comprehensive cooperative transportation planning process carried on between the State and local communities required by the Federal Aid Highway Act of 1962--must include inventories of land-use and land activity, future demands for all modes of transportation, and the development of a comprehensive multimodel transportation plan. It should be emphasized that all modes of transportation--highways, airports, and mass transit--are considered in the 3C planning process.

Air quality coordination is effected through the State Highway Agency and the 3C planning agency. The 3C planning agency must establish a continuing review procedure with the cognizant air pollution control agency. This review focuses on assessment of the consistency of transportation plan with the SIP and the resolution of differences.

The 3C planning agency Policy Committee must determine annually the consistency of the current transportation plan and program with the approved SIP. This determination along with comments from the cognizant air pollution control agency and the Policy Committee's disposition of these comments must be furnished to the Federal Highway Administration. Conflicts between the transportation plan and the SIP are grounds for withholding certification of the transportation plan.

2. Institutional Responsibilities

In the past the State Highway Departments have done most of metropolitan and regional transportation planning. However, new statutes (Highway Act amendments of 1973) require Governors to designate a metropolitan areawide transportation planning agency. About 85 percent had done so by April 1974. Typically, COG's have been designated. Planning for all modes of metropolitan transportation--highways, airports, and mass transit--is accomplished by these agencies.

The areawide planning agency has approval authority on all transportation plans and the responsibility for ensuring that individual projects conform to the areawide plan. Their recommendations are binding on the Secretary of DOT. In addition, the areawide agency may have the authority to withhold Federal funds. Such authority is not statutory and depends on agreement among DOT, the State, and the local agency.

Some Federal money will go to the areawide planning agency for metropolitan and areawide transportation planning.

Coordination of urban transportation planning between the city/county and State levels is through the Urban Transportation Study (UTS) Policy Committee which is composed of elected officials.

Technical capability is supplied from the professional staffs at the State and local level in the form of the UTS Technical Coordinating Committee (TCC). The goals of the UTS Policy Committee is the formulation of long-range and immediate action plans for transportation programs within urban areas.

3. Effective Time Schedules

All metropolitan areawide planning agencies must be designated by 1975. Another important consideration, previously cited, is the annual review for consistency of the transportation plan and the SIP.

4. Interfaces

Transportation affects air quality both directly by the emissions from automobiles, airplanes, and other vehicles, and indirectly by the inducement of industrial development and population growth.

Mass transit affects air quality by reducing the vehicle miles necessary to transport a given quantity of people. However, a certain population density is necessary to support mass transit. Dispersion of population and industrial sites in order to reduce emission density may run counter to the objectives of mass transportation inducements.

Air quality planners should be knowledgeable of highway designs that improve air quality; e.g., exclusive bus lanes and ramps, fewer stops, etc., and the extent to which such designs can be expected to improve air quality. Other technical assistance and information is available from the metropolitan planning agency; e.g., land-use and land-activity inventories and projections. Metropolitan Planning Agencies are also eligible for grants from DOT for planning implementation procedures for transportation strategies related to air quality.

Parking facilities, highways, and airports will be subject to review by EPA or the State air pollution control agency as indirect sources effective in the near future.

5. Special Considerations and Problems

To be effective, air quality maintenance strategies, particularly land-use and transportation controls, must be planned and implemented on a regional basis. Guidelines requiring consideration of environmental effects in all highway projects have results in well-established transportation systems and highway planning, review, and implementation procedures. Sufficient opportunities exist to ensure that planned improvements in transportation services are consistent with air quality standards. The basic problem is how to take advantage of these opportunities early enough in the urban transportation studies and in the regional transportation system planning to avoid bringing unsuitable alternatives into the route location and the highway design stages prior to processing through the EIS and A-95 review processes. Once these stages have been reached, attitudes and interests are often polarized and may be difficult to change.

The well-defined planning and review structure of State departments of transportation suggest several specific recommendations for achieving effective early coordination. States should establish formal channels for coordinating objectives in statewide, regional, and local elements of the State AQMP and of the State Highway Action Plan. These channels can be used to coordinate formulation and updating of the plans, application of the plans in implementing strategies for attaining acceptable levels of air quality, and programming of highway projects.

To achieve coordination at the State level, the State air pollution control agency and the State department of transportation could adopt a joint program management policy that prescribes communication procedures to be followed to ensure consistency in objectives of the State AQMP and of the State Highway Action Plan. Furthermore, the two agencies could assign responsibility to specific positions or individuals for maintaining continuing contacts concerning the goal of securing consistency in program objectives.

At regional level, a closer association in the process of coordinating the development of highway and mass transit projects with the implementation of transportation control strategies is required so that new projects and the general transportation plan do not conflict with the AQMP. The agency responsible for preparation of the AQMP should designate staff planners to coordinate with the transportation planning division of the State department of transportation, UTS project staff, and the TCC of each UTS in setting criteria for air quality and assessing environmental effects of alternative highway and mass transit proposals. The thrust of this cooperative arrangement is full consideration of environmental effects of alternatives at their inception in the transportation planning process and in the system planning stage. At a minimum, the representatives of the State air pollution control and AQMP preparation agency should prepare, through a traffic corridor analysis, a preliminary study report dealing with the environmental effects (air quality) of each highway and mass transit proposal that becomes a candidate for advancement into the route location stage. Objectionable air quality impacts that might lead to definitive opposition in the hearings required during the route location and the highway or mass transit design stages can be identified and documented by such a study.

State and local air quality control agencies should designate staff planners to work with key transportation agencies in local governments within an AQMA and assist community planners in understanding the air quality implications associated with elements of community development plans and transportation programs.

State and local air pollution control agencies should seek to have advisory representation on the policy and technical committees of local planning groups responsible for:

- Formulating land-use policies,
- Developing community long-range plans,
- Determining transportation needs and goals, and
- Conducting transportation studies.

It is recognized that the first two groups listed above do not directly cause transportation projects to emerge, yet in fact these two groups are the decision makers who influence the shape and character of the community in a manner that generates travel demand and associated transportation requirements, e.g., planning activities. The last two groups represent the source of decisions leading directly to the programming of transportation facilities for the community, e.g., implementation activities.

C. LAND-USE PROGRAMS

1. Background and Purpose of the Legislation

The prevalent approach to land-use planning and implementation of the plans through zoning is based on the Standard Zoning Enabling Act of 1926 (SZEA) and the Standard Planning Enabling Act of 1928 (SPEA) (ref. 6). These two acts set the stage for consideration of interactions among land-use planning and environmental control activities. Perhaps the crux of the problem of coordinating air quality maintenance activities with other environmental protection activities and land-use and transportation planning activities lies in two features of these two acts. The first feature is that all development control and planning authority are delegated to the city/county level. The tacit assumption is that all interests can be satisfied at this level. No mechanism is available for consideration of other than city/county interests or for resolution of inter-city/county development conflicts (ref. 6). Air quality is an interest that inherently transcends city/county boundaries. Regional or air-basin-wide planning is required to consider the effects of land-use and transportation strategies in maintaining air quality. On the other hand, implementation of air quality strategies through land-use measures by air quality maintenance agencies impinges on traditionally city/county authority.

The second feature actually deals with the interpretation of the acts. Although the SZEA called for the zoning plan to be "made in accordance with a comprehensive plan...", judicial interpretation has eliminated the necessity for zoning regulations to be consistent with the planning. Furthermore, permissive wording in the act has resulted in separation of responsibilities for planning and plan implementation in many States (ref. 6). Such controls as zoning and building permits are not required to be in conformance with any general growth and development plan. Only a few States require that local zoning regulations be based on a comprehensive plan (ref. 7).

As a result of these practical difficulties in the SZEA/SPEA planning and control framework, some States have directly entered the land-use field in order to implement development controls and environmental protection measures (refs. 8, 9). Such actions generally have been in response to specific and unique problem areas in each State. As a result a wide variety of approaches and intergovernmental frameworks are in existence.

To a considerable extent, land-use planning and environmental control programs have developed separately at all levels of government. Environmental protection programs have been determined to a considerable extent by Federal legislation and have been fragmented by single-purpose programs directed at specific environmental problems--including air pollution, water pollution, solid waste, and noise.

Land-use plans represent the desired or long-range conceptualization of a community or region. As such they are planning tools and serve as inputs to the decisionmaking process. The actual configuration that a community or region will take in the future is strongly influenced by land-use actions (zoning, public utility extension, tax structure, etc.) at the city level. Thus, air quality maintenance activities must be coordinated with land-use planning and implementation in the development of the AQMP to ensure the use of compatible growth and development projections, and during the implementation to determine the impact of proposed variances on air quality.

Several legislative acts and proposed acts have recently arisen in an effort to establish a national land-use policy.

a. Coastal Zone Management Act. The Coastal Zone Management Act of 1972 (CZMA) establishes a national policy for the development of a program to manage the land and water resources of the coastal zone (ref. 10). The act recognizes the multiplicity of uses and values ascribed to lands and waters within the coastal zone and encourages the management of these lands through an approved plan that incorporates important ecological, cultural, esthetic, and economic values. States are encouraged to rely upon and coordinate their activities with appropriate local governments and regional agencies in the development of a CZMP. Incentives to prepare and administer a comprehensive CZMP are provided, but no specific land/or water-use decisions are made. States submitting grant requests for programs that impinge on the CZMP must show that these programs are consistent with the approved plan. Further, according to section 307(f) of the act, requirements of the Clean Air act as amended and subsequent Federal regulations shall be incorporated into the CZMP. An important point of the act is that the State land-use control authority, when necessary, can supersede local governmental authority. This is in marked contrast to the tradition under which all 50 States have delegated land-use regulation power to local city/or county governments (ref. 11).

b. National Land-Use Policy. National land-use policy legislation has so far failed to pass. Some States have enacted and many are considering their own versions of land-use planning legislation. Much of this legislation is single purpose, directed toward controlling specific problems of development.

2. Institutional Responsibilities

a. Coastal Zone Management. Each coastal State (those on the Seaboard plus those bordering the Great Lakes) has created or is in the process of creating an agency to accept responsibility for development and administration of the CZMP (as of March 1974). This agency may well be a part of an existing agency responsible for some or all of the activities related to environmental management.

National Land-Use Policy. H.R. 10294 encourages the use of general purpose local governments to implement the comprehensive planning process of the act. S.R. 268 provides that a State land-use planning agency be advised by an intergovernmental advisory council, including chief elected officials of general purpose local governments.

3. Effective Time Schedules

Since the Coastal Zone Management Act does not make CZMP's mandatory--only providing incentives for their preparation--no deadline is applicable.

H.R. 10294 has failed to reach the House floor for action. Therefore, it is uncertain whether tay Federal land-use legislation will be forthcoming in 1974.

4. Interfaces

As with the development and implementation of the AQMP, the development and administration of the CZMP requires an in-depth examination of the future uses of the area, the likely development as a result of population growth, and the desired environmental quality. Thus, the activities required for air quality maintenance and coastal zone management are much the same--legal, zoning, planning, development, economic analysis, air resource management, and water resource management.

5. Special Considerations or Problems

Perhaps the most significant feature of the CZMA is that land-use planning and control authority is placed in the same State agency. When necessary, the State land-use control program within the coastal zones of coastal States is required to supersede local authority. Furthermore, air quality requirements must be incorporated in the development of the CZMP. Thus, a State air quality agency working within the agency framework of the CZMP could have land-use control authority preemptive over local authority. However, the land-use controls would be exercised by the State coastal zone management and not by the State air pollution control agency.

c. Other Programs. Table A-2 taken from Regional Decision-Making: New Strategies for Substate District (ref. 11) summarizes Federal areawide programs. The programs discussed above with major interaction with air quality programs are included. Many of these programs are optional as indicated by the second column.

Table A-2. Operational approaches of Federal areawide programs: 1972

Name of program	Areawide use of program	Special areawide organizational requirements	Functional components of areawide programs other than land use	Areawide coordinative mechanisms used				
				Required plan	Coord. council	A-95 Review and comment	Areawide authority to veto funding	Federal funding channeled through a single areawide agency
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Air Pollution Control	Optional	Yes	Single	State	No	Yes	No	No
Airport System Planning	Optional	No	Single	State	No	Yes	No	Yes
Appalachian Local Devel. Dist. Asst.	Optional	Yes	Multiple	State & area	Yes	Yes	No[1]	Yes[2]
Areawide Comp. Health Planning (314b)	Optional	Yes	Single	State & area	Yes	Yes	No	Yes
Areawide Comp. Plng. Asst. (701)	Required	Yes	Multiple	Area	No	Yes	No	Yes[3]
Areawide Waste Treatment Management	Required	Yes	Single	State & area	No	Yes	Yes	Yes
Community Action (CAP)	Optional[4]	Yes	Multiple	Area	Yes	Yes	Yes	No
Economic Development Planning	Optional	Yes	Multiple	Area	Yes	Yes	No	Yes[2]
New Communities	Optional	No	Multiple	None	No	Yes	No	No
Open Space	Optional	No[5]	Single	Area	No	Yes	No	No
Project Notification & Review (A-95)	Optional	Yes	Multiple	None	No	--	--	--
Regional Medical Program	Required	Yes	Single	Area	Yes	Yes	Yes	Yes
Resource Conservation & Development	Optional	Yes	Multiple	Area	Yes	Yes	Yes	Yes
Rural Development Planning	Optional	No	Multiple	Undetermined				
Rural Industrialization Asst.	Optional	No	Multiple	Undetermined				
Solid Waste Planning Grants	Optional	No	Single	None	No	Yes	No	Yes
Urban Mass Transportation Plng.	Optional	No	Single	Area	No	Yes	Yes	Yes
Urban Transportation Planning	Required	Yes	Single	Area	Yes	Yes	No	Yes[2]
Water/Sewer Facilities	Optional	No[5]	Single	Area	No	Yes	No	No
Water & Sewer Planning for Rural Communities	Required[6]	No	Single	Area[7]	No	Yes	No	Yes[8]
Water & Waste Disposal Systems for Rural Communities	Optional	No	Single	Area[6]	No	Yes	No	Yes
Water Quality Management Planning	Required	Yes	Single	State & area	No	Yes	Yes	Yes

[1] Some States have given this authority to their local development districts (LDD's). In such cases, the LDD veto is honored by ARC.

[2] Action projects do not follow this pattern.

[3] Except some interstates.

[4] Although a community action agency is required, it need not be areawide. Indeed, a large number of them are single county or single city in coverage.

[5] An areawide planning organization (of the 701 type) is required, but not an areawide implementation organization. As of 1971, approximately 185 metropolitan planning organizations and 149 nonmetropolitan planning organizations were certified as meeting the open space and water/sewer planning requirements. In a few very exceptional cases, a State agency has been recognized on a temporary basis as the planning organization.

[6] Required only if USDA/FHA funding involves a grant (rather than a loan) for water and waste disposal system.

[7] Most of these plans are countywide, but they may be multicounty.

[8] This agency has usually been the county, but a preference is now stated for multicounty substate districts.

Sources: Catalog of Federal Domestic Assistance, Federal Register, and program guides and directories.

Table A-2 indicates whether a Federal areawide program is mandated (column 1), whether organization requirements exist (column 2), whether it is single-or multipurpose (column 3), and the mechanisms that can be used to promote areawide coordination (columns 4-8).

States frequently play an important role in determining regional participation in programs that are Federally optional on a regional level.

The table indicates a strong institution-building desire by the Federal government; funding is often channeled through a single areawide agency and veto power over funding is often given to the agency. However, the agency can be either single-or multipurpose.

A technique used to strengthen planning is the use of coordination councils (column 5) with representatives from all agencies and interests affected by a proposed program.

Areawide programs may or may not include planning and implementation authority (veto and review over funding).

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3. Federal Register 39, 7270.
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7. D. R. Mandelker. The Zoning Dilemma, 1971, pp. 57-63.
8. Frank. "Renaissance," pp. 16-17.
9. Croke. Relationship, pp. 38-40.

10. Frank. "Renaissance".

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12. Advisory Commission on Intergovernmental Districts. Regional Decision-Making: New Strategies for Substate Districts, October 1973, pp. 180-81.

Appendix B: EVALUATING SOCIAL IMPACT OF MAINTENANCE STRATEGIES

A. INTRODUCTION

This appendix describes how A. J. Klee's approach to evaluating alternatives (ref. 1) can be used to evaluate the social impact of the various air quality maintenance strategies. A simplified trend approach is also presented in the event since the availability of personnel precludes the use of Klee's model. The simplified approach may be used. in such a case with prior approval of the Regional Office. This approach can be used to evaluate each individual measure of a maintenance strategy, which would give more reliable results. The agency planning for air quality maintenance may feel that a very detailed approach is required because of the contrasting social impacts of several measures constituting a maintenance strategy. However, in general, because of the time required to analyze each measure, it is recommended that Klee's approach be applied at the level of air quality maintenance strategies. By utilizing this approach, the agency planning for air quality maintenance can develop an estimate of the relative social impact of the strategies. A discussion of the theoretical justification of the approach is presented at the end of this appendix.

The approach consists of six basic steps:

1. Choose the social factors that the planning agency feels are important.
2. Determine the relative importance to the planning agency of the social factors; use the relative importance to obtain a weighting factor for each social factor.
3. Analyze the weights developed in step 2 by means of a consistency check.
4. Estimate the trend effect of each strategy on the social factors: Will a strategy have a beneficial effect, no effect, or an adverse effect?

5. (a) For each social factor, determine the relative importance of the alternative strategies (in a manner similar to that of step 2). (b) Use consistency check on number developed in part (a).

6. Combine the numbers developed in steps 2 and 5 to determine the quantitative evaluation of each strategy.

The remainder of this appendix gives a detailed explanation of steps 1-6, including a numerical example.

B. DESCRIPTION

1. Step 1

The agency planning for air quality maintenance should decide upon a list of the social factors or phenomena that may undergo change in response to the various, feasible air quality maintenance strategies. These social factors should include any factor that cannot be evaluated in terms of cost. (Note: Increased usage of resources and raw materials may be an adverse effect of some strategies. If these resources are scarce, the planning agency should consider the possibility that increased demand will cause increased prices. Such effects should be included under costs. However, the planning agency may decide that increased usage of a resource will not cause a price increase, although such increased usage is felt to be undesirable with respect to conservation measures. This type of effect should be included as a social factor.)

Examples of some social factors are given in table B-1. The example list is not intended to be exhaustive or include all of the relevant social factors; the planning agency must be the judge of the factors it wishes to include. Community goals and objectives provide the best source of these factors.

Insofar as possible, the social factors should be mutually exclusive. Factors that will respond in an identical or very similar fashion to the strategies should be replaced by a single overall social factor. This should be done to avoid overemphasizing an area of concern. For example, rather than have separate entries for ease of access to cultural and historic sites and for ease of access to educational facilities, both entries should be combined.

2. Step 2

Next, the importance of these social factors to the locality

Table B-1. Examples of social factors

Transportation

Ease of access to:

- places of employment
- educational, cultural, and historical facilities
- recreational facilities
- commercial (shopping) areas

Equitable distribution of cost

Population

- size
- distribution
- density
- mobility

Institutional relationships

- maintenance of traditional political authority
- maintenance of the informal community structure

Employment

- mobility
- growth
- distribution

Quality of life

- change in water quality or supply
- loss of open space
- impact on ecologically critical areas
- impact on regional noise levels

Other

---

should be determined. This can be done in the following manner. List the factors in some arbitrary manner (see table B-2). The order of the factors should not affect the final weighting factors (the Wi's, although intermediate results will be altered. Fill in the R_i column: next to the first factor, enter R_1 = (importance of factor 1) : (importance of factor 2), i.e., R_1 is an indication of the relative importance to the local planning agency of the importance of factor 1 as compared to factor 2. R_2 is the relative importance of factor 2 compared to factor 3. Thus R_i = (importance of factor i) : (importance of factor $_{i+1}$). There is no entry for the last factor. To fill in the K_i column, start at the bottom of the column and enter the figure 1.0. The next-to-last row will have $K_{n=1} = K_n \cdot R_{n-1} = R_{n-1}$. To compute K_{n-2}, multiply K_{n-1} by R_{n-2}. Continue this "zig-zag" approach, $K_i = K_{i+1} \cdot R_i$. Each row will contain an entry for K_i. After entering K_1, sum all of the entries in the K_i column, obtaining K. Each R_i is the relative importance of the ith factor compared to the i + 1st factor. Each K_i is the relative importance of the ith factor compared to all the other factors. It is felt that for small sets of factors (say 4 or less), the agency planning for air quality maintenance could skip the R_i column and begin with the K_i column. However, for larger sets of factors, it is too difficult to consider all the factors simultaneously; thus, the pairwise approach of filling in the R_i column will be easier to implement. Finally, to fill in the W_i column, simply divide the corresponding K_i by the sum K, i.e., $W_1 = K_1 : K$, $W_2 = K$, etc. The sum of the W_i should be 1.0.

Table B-2. Derivation of the W_i

Social factor	R_i	K_i	W_i
Factor 1	R_1	K_1	$K_1 \div K$
Factor 2	R_2	K_2	$K_2 \div K$
Factor 3	R_3	K_3	$K_3 \div K$
.	.	.	.
.	.	.	.
.	.	.	.
Factor n-1	R_{n-1}	K_{n-1}	$K_{n-1} \div K$
Factor n	----	1.0	$1.0 \div K$
		K	

As an example, consider Anycounty, U.S.A. Its local planning agency has decided that the following social factors are of importance: ease of access to employment, ease of access to recreation, density of population, and mobility of employment. These factors are listed in arbitrary order in table B-3. After some discussion, the planning agency has decided on the figures entered in the R_i column: mobility of employment is considered to be 3.0 times as important as ease of access to recreation, while ease of access to recreation is only one-fourth as important as population density, and population is felt to be equally important as ease of access to employment. Next, the K_i column is computed, starting with $K_4 = 1.0$. Then $K_3 = K_4 \cdot R_3 = 1.0 \cdot 1.0$. Similarly, $K_2 = K_3 \cdot R_2 = 1.0 \cdot 0.25 = 0.25$ and $K_1 = K_2 \cdot R_1 = 0.25 \cdot 3.0 = 0.75$. The sum of the K_i is $K = 0.75 + 0.25 + 1.0 + 1.0 = 3.0$. Finally, the W_i column is computed by dividing each K_i by K, so that $W_1 = K_1 \div K = 0.75 \div 3.0 = 0.25$, etc.

3. Step 3

Once table B-2 has been completed, a consistency check on the values of the W_i should be performed. This can be done by using table B-4. Enter the factors in the order of their computed W_i's, the one with the largest W_i at the top. To compute the C_i column, start at the bottom. No entry is entered for the last row. For the next-to-last row, C_{n-1} is computed from $C_{n-1} = W_n$. Next, $C_{n-2} = C_{n-1} + W_{n-1}$. Continue zigzagging; in general, $C_i = C_{i+1} + W_{i+1}$. Finally, $C_1 = C_2 + W_2$. The

Table B-3. Consistency check

Social factor (ordered)	W_i	C_i
Factor 1	W_1	C_1
Factor 2	W_2	C_2
.	.	.
.	.	.
.	.	.
Factor n-1	W_{n-1}	C_{n-1}
Factor n	W_n	----

Table B-4. Example of derivation of W_i

Social factor	R_i	K_i	W_i
Mobility of employment	3.0	0.75	0.250
Ease of access, recreation	0.25	0.25	0.083
Population density	1.0	1.0	0.333
Ease of access, employment	---	1.0	0.333
		K = 3.0	1.000

consistency check then asks the planning agency to compare a factor with all of the factors appearing below it. Suppose W_1 is greater than C_1. Then it should be the opinion of the planners that factor 1 is more important than all the other factors combined. Similarly, $W_2 < C_2$ would imply that the agency felt that factor 2 was not as important as factors 3, 4,..., n combined. If any inconsistency is noted, redo the calculations of the W_i and check (again) for consistency.

For a consistency check of the W_i computed by Anycounty, see table B-5. According to the calculated W_i, the Anycounty planners consider mobility of employment more important than ease of access to recreation; ease of access to employment is equally as important as mobility of

Table B-5. Example of consistency check

Social factor (ordered)	W_i	C_i
Population density	0.333	0.667
Ease of access, employment	0.333	0.333
Mobility of employment	0.25	0.083
Ease of access, recreation	0.083	--

employment and ease of access to recreation combined, and population density is less important than all of the other factors combined.

4. Step 4

Next, calculate the subscores of the maintenance strategies for each social factor, using figure B-1 as a worksheet. If the local planning agency considers that a strategy will have different effects, depending on the time served, calculations should be made for these time periods. For factor 1, the local planning agency should decide the relative importance of the effect of each of the strategies. Fill out the R_j column for factor 1, where R_1 = (importance of effect of strategy 1) : (importance of effect of strategy 2). Complete the R_j column, noting that no entry is required for the last row. Next compute the K_j by setting $K_m = 1.0$ and then $K_{m-1} = K_m \cdot R_{m-1}$. Continue zig-zagging up, finding $K_j = K_{j+1} \cdot R_j$. After finding K_1, sum the K_j to obtain K. Finally, compute the S_{1j} by dividing each K_j by K. Now duplicate this process for factor 2, factor 3, etc.

Assume that the Anycounty planners have determined that there are five feasible strategies, and their effects on the social factors do not change significantly through time. Table B-6 shows example subscores for their maintenance strategies.

Note that the size of the figure 1 worksheet (as shown by the example table B-6) is very dependent upon the number of alternative air quality maintenance strategies. Thus, the more strategies that can be eliminated from consideration early in the process by screening, the simpler the evaluation of the stragegies will be.

If desired, the calculation of the social factor-maintenance strategy subscores can be checked for consistency by a procedure similar to that used for checking the social factor weights.

5. Step 5

Finally, the subscores are combined with the factor weights to determine the overall social effect of each alternative strategy. This should be done for each of the time periods that was used for table B-6. Tables B-7 and B-8 should be used for this purpose. Enter the appropriate weighting factor (W_i) in each column of table B-7 (see table B-2), and then enter the appropriate subscores in the S_{ij} columns (see table

Worksheet for evaluation of subscores

Time period: From __________ to __________

Social factor	R_j	K_j	S_{ij}
Factor 1:			
Strategy 1	R_1	K_1	S_{11}
Strategy 2	R_2	K_2	S_{12}
.	.	.	.
.	.	.	.
.	.	.	.
Strategy m	--	1.0	S_{1m}
		K	1.0
Factor 2:			
Strategy 1	R_1	K_1	S_{21}
Strategy 2	R_2	K_2	S_{22}
.	.	.	.
.	.	.	.
.	.	.	.
Strategy m	--	1.0	S_{2m}
		K	1.0
.	.	.	.
.	.	.	.
.	.	.	.
.	.	.	.
Factor n:			
Strategy 1	R_1	K_1	S_{n1}
Strategy 2	R_2	K_2	S_{n2}
.	.	.	.
.	.	.	.
.	.	.	.
Strategy m	--	1.0	S_{nm}
		K	1.0

Figure B-1. Worksheet for social evaluation of maintenance measure.

Table B-6. Example of subscore evaluation

Social factors	R_j	K_j	S_{ij}
Ease of access, employment			
Strategy 1	3.0	0.75	0.250
Strategy 2	0.5	0.25	0.083
Strategy 3	1.0	0.50	0.167
Strategy 4	0.5	0.5	0.167
Strategy 5	--	1.0	0.333
		3.0	
Ease of access, recreation			
Strategy 1	0.4	2.0	0.154
Strategy 2	2.0	5.0	0.385
Strategy 3	1.0	2.5	0.192
Strategy 4	2.5	2.5	0.192
Strategy 5	--	1.0	0.077
		13.0	
Population density			
Strategy 1	0.70	1.029	0.166
Strategy 2	0.70	1.47	0.237
Strategy 3	3.5	2.1	0.339
Strategy 4	0.6	0.60	0.097
Strategy 5	--	1.00	0.161
		6.199	
Mobility of employment			
Strategy 1	1.0	2.8	0.192
Strategy 2	0.7	2.8	0.192
Strategy 3	1.0	4.0	0.274
Strategy 4	4.0	4.0	0.274
Strategy 5	--	1.0	0.068
		14.6	

Table B-7. Computation of evaluation scores

Time period: From ______ to __________

Maintenance strategies	Social factor 1			...	Social factor n			Evaluation scores (A_j)
	W_1	S_{1j}	Prod.		W_n	S_{nj}	Prod.	
Strategy 1	W_1	S_{11}	$W_1 \times S_{11}$		W_n	S_{n1}	$W_n \times S_{n1}$	A_1
Strategy 2	W_1	S_{12}	$W_1 \times S_{12}$		W_n	S_{n2}	$W_n \times S_{n2}$	A_2
.	.	.	.		.	.	.	.
.	.	.	.	...	.	.	.	.
.	.	.	.		.	.	.	.
Strategy m	W_1	S_{1m}	$W_1 \times S_{1m}$		W_n	S_{nm}	$W_n \times S_{nm}$	A_m

Table B-8. Summary, ranking of evaluation scores

Maintenance strategies	Evaluation scores by time period			Average evaluation score	Rank
	From __________ to __________	...	From __________ to __________		
Strategy 1	A_1		A_1	Avg_1	
Strategy 2	A_2		A_2	Avg_2	
.	.		.	.	
.	.	...	.	.	
.	.		.	.	
Strategy m	A_m		A_m	Avg_m	

B-7). The product column is simply the product of the W_i entry with the S_{ij} entry. Finally, the evaluations scores A_j are found by summing the product columns across each row. Use table B-8 to summarize the evaluation scores by time period. Enter the Evaluation scores from table B-7 into the appropriate column in table B-8, and then compute the average evaluation score for each strategy. Finally, rank the strategies by assigning the highest rank (one) to the strategy with the largest average evaluation, etc.

Averaging the evaluation scores implies that social impact occurring in the future is as important as impact occurring at the present time. However, because of uncertainty about the future, the agency planning for air quality maintenance may feel that immediate, more predictable consequences are more important than long-term uncertain outcomes. In such a case, immediate consequences should be considered more important, and a careful comparison of the evaluation scores through time should be made. (In fact, the agency may want to multiply evaluation scores for more long-range time periods by factors less than one (1.00) to give a type of present value, somewhat similar to the approach discussed in appendix C below. However, such a procedure introduces a new problem: exactly what factors should be used? The resolution of this problem is not at all obvious.) See table B-9 for an example. Although strategy 3 has the highest average through time, the agency might feel that social impacts in the period 1975-1980 are more important than those in 1980-1985 and 1985-1990. Hence they could select strategy 1 as being the most desirable and strategy 2 as being next most desirable.

Table B-9. Example of differences through time

Maintenance Strategies	From 1975 To 1980	From 1980 To 1985	From 1985 To 1990	Avg. Evaluation Score	Rank
Strategy 1	0.200	0.180	0.170	0.183	3
Strategy 2	0.180	0.200	0.190	0.190	2
Strategy 3	0.180	0.185	0.190	0.195	1

The evaluation scores and the ranking for the Anycounty example are shown in table B-10. Only one table is needed because no changes through time occurred in the example. Thus, it was not necessary to average.

C. THEORETICAL BASES

Theory: Mathematically, the evaluation scores are found from the formula

$$A_j = \sum_{i=1}^{n} W_i S_{ij},$$

for alternative air quality maintenance strategies j = 1,2,...,m. Implicit in this approach are the assumptions that the utilities of the social factors are all measured on a single utility scale, and that the utility of combinations of the factors can be found by adding the individual utilities. This assumption of additivity would be violated if the local planning agency felt that the utility of some combination of social factors was affected by an interaction among the factors. The requirement that the social factors be mutually exclusive is required to ensure additivity.

Another assumption required for the linear additive model is that over the area of relevance, the isopreference curves (substitution curves) that relate the utilities of the social factors are essentially linear. Such an assumption would be violated if a local planning agency felt that beyond a certain point, it would not be willing to trade improvement in factor A for a decline in factor B. However, the screening of alternative air quality maintenance strategies before evaluation should remove strategies that would have too severe an effect on

Table B-10. Example of computation of evaluation scores

Strategies	Ease of access to employment			Ease of access to golf			Population density			Mobility of employment			Evaluation scores of alternatives	Rank
	W_1	S_{1j}	Prod.	W_2	S_{2j}	Prod.	W_3	S_{3j}	Prod.	W_4	W_{4j}	Prod.		
Strategy 1	0.333	0.250	0.083	0.083	0.154	0.013	0.333	0.166	0.056	0.25	0.192	0.048	0.200	2
Strategy 2	0.333	0.083	0.028	0.083	0.385	0.032	0.333	0.237	0.079	0.25	0.192	0.048	0.187	4
Strategy 3	0.333	0.167	0.056	0.083	0.192	0.016	0.333	0.339	0.113	0.25	0.274	0.069	0.254	1
Strategy 4	0.333	0.167	0.056	0.083	0.192	0.016	0.333	0.097	0.032	0.25	0.274	0.069	0.173	5
Strategy 5	0.333	0.333	0.111	0.083	0.077	0.006	0.333	0.161	0.054	0.25	0.068	0.017	0.188	3

one or more of the social factors. Thus, the assumption of linearity in the isopreference curves can probably be satisfied by the preliminary screening of strategies.

It should be noted that approaches more rigorous than that of Klee can be adopted. For example, Keenly (see ref. 2) presents an analysis of proposed airport sites for Mexico City. The analysis begins by estimating the joint probability density function of the possible impacts of each of the various alternatives. The utility functions for each of the factors that will be impacted are then developed, along with the requisite scaling factors and constants to determine if an additive or multiplicative model is appropriate. Finally, the various alternatives are compared by computing their expected utilities.

Klee's approach assumes that the social impacts will occur with certainty, that an additive utility function is appropriate, and that a common utility scale is approximate. Thus, his approach can be placed somewhere between a purely subjective one and the more rigorous decision analysis approach of Keeney. Should the agency planning for air quality maintenance feel that sufficient expertise and time are available, then it may use Keeney's approach. Of course, this is optional and not required. For further discussion of these points, see references 1, 2, 3, 4, 5 and 6.

D. SIMPLIFIED TREND APPROACH

This simplified approach for evaluating the social impact of a maintenance strategy is based on direction of change in the social factors, i.e., expected to improve, no change, not applicable, or expected to worsen.

The first step in this simplified approach is the same as the first step in Klee's approach, described in preceding sections of this appendix.

Next, the air quality planner, in conjunction with political figures and other experts, should determine its impact on direction of change of the social indicators. A "+" can be used to signify that the direction of change is favorable, "0" to indicate that no change will take place or that the measure is not applicable, and "-" that the impact on the direction of change is unfavorable. Adding the pluses and minuses provides an index for the comparison of alternative measures. The various elements can be weighed if desired to place greater or less weight on any specific social indicator. Decision to use weighting factors necessarily rests with the agency(ies) responsible for the preparation of the AQMP. A suggested worksheet for accomplishing this evaluation is presented in figure B-2.

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Source factor evaluation

AQMA ____________________ Maintenance strategy ____________________

	Impact	Weighting factor
Transportation		
Ease of access to:		
· places of employment		
· educational, cultural, and historical facilities		
· recreational facilities		
· commercial (shopping) areas		
Equitable distribution of cost		
Population		
· size		
· distribution		
· density		
· mobility		
Institutional relationships		
· maintenance of traditional political authority		
· maintenance of the informal community structure		
Employment		
· mobility		
· growth		
· distribution		
Quality of life		
· change in water quality or supply		
· loss of open space		
· impact on ecologically critical areas		
· impact on regional noise levels		
Other		

Figure B-2. Worksheet for evaluating social impact of a maintenance measure.

Appendix C: EXAMPLE OF PRESENT VALUE CALCULATIONS

Suppose the local planning agency of Anytown, U.S.A., is comparing two different air quality maintenance strategies. The time period will be 20 years, and the planners have decided to consider the possibilities of 7% and 10% interest. All costs are assumed to occur on December 31 of the year in which they are incurred (If a cost will occur in January or February, the Anytown planners assume that it will have occurred the preceding year). The data for the alternatives are:

Alternative I

Capital Costs: $1 million in years 1, 5, 20
Operating Costs: $10 thousand per year

Alternative II

Capital Costs: $0.5 million in year 1
1.0 million in year 10
2.0 million in year 20
Operating Costs: $50 thousand per year

The total undiscounted costs for the alternatives are $3.2 million and $4.5 million, respectively. However, the present value of these costs are shown in table C-1. At an interest rate of 7 percent, there is little economic advantage in either alternative. However, at a rate of 10 percent, alternative II is more acceptable.

Table C-1. Examples of present value calculations

Alternatives, years	Cost	Discount factor, costs			
		7 percent		10 percent	
Alternative I		Factor*	Discounted cost	Factor*	Discounted cost
Year 1	$1 million	0.93458	$934,580	0.90909	$909,090
Year 5	$1 million	0.71299	712,990	0.62092	690,920
Year 20	$1 million	0.25842	258,420	0.14864	148,640
Operating	$10 thousand	10.59400	105,940	8.51360	85,136
Total present value		$2,011,930		$1,763,786	
Alternative II					
Year 1	$0.5 million	0.93458	$467,290	0.90909	$454,545
Year 10	1.0 million	0.50835	508,350	0.62092	385,540
Year 20	2.0 million	0.25842	516,840	0.14864	297,280
Operating	50 thousand	10.59400	529,700	8.51360	425,680
Total present value		$2,022,180		$1,563,045	

*Factors can be obtained from any standard reference book such as Principles of Engineering Economy by E. L. Grant and W. Grant Ireson, Ronald Press, N.Y.

Note: The factors for discounting single amounts can be computed from the formula

$$\text{Present Value} = \text{Cost} \cdot (1 + i)^{-t}$$

and the factors for discounting constant amounts incurred over a period of years can be computed from the formula

$$\text{Present Value} = \text{Annual Cost} \cdot \frac{1 - (1 + i)^{-t}}{i}$$

where i = Interest rate
t = Number of years

Appendix D: MAINTENANCE MEASURES

Detailed descriptions of several potential air quality maintenance measures are presented in volume III of this guideline series, Control Strategies. The 18 measures included in that document cover a broad range of options, but are not intended to be all-inclusive. Those responsible for plan preparation are encouraged to devise other measures with special applicability to the AQMA's in which they are to be employed.

A summary of the descriptions for each of the measures is provided in this volume. The first nine listed have been categorized as land-use and planning measures because they are concerned primarily with planning for future air quality and with new emission sources. The remaining nine measures have been categorized as emission control measures, and involve technological or operational changes that affect both existing and new sources. The latter measures tend to have a more direct effect on emissions from individual sources and, hence, their impacts can be quantified more readily than those of the land-use and planning measures.

A. EMISSION ALLOCATION PROCEDURES

Emission allocation is a maintenance measure that requires emissions of pollutants be limited to prescribed levels within an airshed, air basin, AQMA, or portion thereof. The allocation limit is specified based on some relationship between the total pollutant emissions in the area of concern and the assimilative capacity of the ambient air in the area. The assumption is made that this relationship can be projected to establish the total acceptable amount of emissions that can be allowed at a future time.

Emission allocation procedures form an administrative, enforcement, and analytical framework within which emission control measures and specific planning actions can be applied. By itself, this measure usually does not provide emission reductions, so it is dependent on the ability of other appropriate measures to provide reductions shown to be needed in particular areas. However, it does provide control over the admittance of new sources into areas that are approaching or at their emission allocation limit.

The necessary projections of future emissions are obtained from estimates of future areas and types of development combined with land-use-based emission factors for these developments. Therefore, land-use and transportation plans for the area are critical to the establishment of emission allocation procedures. Participation by the land-use planning agency is necessary for implementation.

The measure may be applied to all pollutants and to both existing and new point, line, and area sources. It provides a transition between the plans for attainment (SIP) and maintenance (AQMP) of NAAQS by prescribing a single level of emissions for each subarea that is applicable for both plans.

B. REGIONAL DEVELOPMENT PLANNING

Identical groups of air pollutant emission sources placed in different configurations can result in significantly different ambient air quality concentrations. This premise is the basis for including regional development planning as a maintenance measure. Air quality considerations may be made an integral part of the regional planning process; and constraints on development may even be stated in regional plans if they are indicated to be necessary to maintain standards. This is not presently done. Over a long period of time, regional development policies by themselves may have a significant effect on the location of pollutant emission sources and on the exposure of the populace to them.

From a practical standpoint, it must be recognized that regional plans, as well as community master plans, rarely carry any legal enforceability. They normally constitute a statement of the goals and aspirations of a region or community. Because they lack enforceability, comprehensive regional plans are dependent on measures such as zoning and other land-use ordinances for their implementation. Notwithstanding, a comprehensive regional plan is a prerequisite if implementation measures are to be coordinated for the attainment of the long-term land-use and environmental objectives.

Four principal elements of regional planning can be used to assist in maintaining air quality: a) regional form, b) open space planning, c) stationary source location, and d) transportation planning. Evaluation of existing regional plans for compatibility with future air quality maintenance requires projections of the emissions associated with different land uses and atmospheric dispersion modeling of these projected emissions to estimate ambient air quality. The current state-of-the-art for projection and modeling procedures is not sufficiently advanced to permit accurate determination of the relationship between land use and air quality in many cases. As modeling techniques improve and more planning agencies incorporate environmental criteria into their planning process, this measure is expected to have widespread use.

C. EMISSION DENSITY ZONING

Emission density zoning is a maintenance measure that requires emissions of a pollutant to be limited to prescribed levels within a defined spatial area. A limit would be established in terms of the amount of emissions per area per time period, such as pounds of particulates per acre per year. Such a limitation may be administered by an air pollution control agency in conjunction with planners and zoning administrators.

Emission density zoning may be applied to existing and new sources. For example, it may be estimated that a heavy industrial zone could contain only those plants that would emit no more than 3 tons of total suspended particulates per square mile of lot size per day. A light industrial zone might have a ceiling of no more than 1 ton per square mile per day. Similar limits might also be established for commercial, institutional, and residential areas.

The purpose of such a spatially defined emission limitation technique would be: (a) to ensure that concentrations of pollutant emissions in a small area ("hot spot") would be avoided, and (b) to maintain local and regional air quality at prescribed levels.

Emission density zoning could probably only be administered for stationary source emissions, so the measure is most applicable for sulfur oxides and particulate pollutants. There is no conceptual reason why emission density zoning could not be applied to other pollutants, such as carbon monoxide, hydrocarbons, or oxides of nitrogen, for the portion of total emissions produced by stationary sources. For example, the emissions of hydrocarbons from petroleum refining and storage might be regulated through emission density zoning. Rather, the problem is an operational one, related to how the emission rates would be set.

Emission density zoning can be implemented either as a secondary requirement for new and modified sources (in addition to point source regulations) or as a replacement for point source regulations. In most cases, it is unlikely that existing regulations would be abandoned. Hence, projected violation of either point source or emission density zoning requirements would usually be grounds to deny construction or operation of the source.

D. ZONING APPROVALS AND OTHER INDIRECT REGULATORY CONTROLS

Regulatory land-use management techniques are primarily concerned with the larger issues of controlling and directing urban growth and only indirectly with the long-term maintenance of air quality. Nonetheless, they may have significant impact if air quality is used as a criterion in setting land-use policy. The regulatory land-use controls include:

- Zoning
- Subdivision regulations
- Capital facility ordinances
- Development timing controls
- Moratoria
- Transferable development rights
- Tax policy
- Capital improvement programming
- Critical environmental area controls
- A-95 review process

These implementation measures can be used to channel growth into areas that can contain it, while discouraging growth in already overburdened areas. Because the land-use management measures act primarily to restrict or direct urban growth, they are not feasible techniques for AQMA-wide application. Implementation of any of these land-use management techniques obviously must be preceded by an air quality analysis that provides a framework and direction for the program. It is assumed that the effect of these regulatory controls on air quality can be accurately determined. Only if this is the case can the implementing agency know where within the AQMA to discourage and where to channel development.

E. TRANSPORTATION CONTROLS

Transportation controls include a diverse group of measures that, either directly or indirectly, can potentially reduce emissions from motor vehicles by one of two broad approaches: (a) reducing the pollutant emission rate per vehicle-mile of travel (VMT), or (b) reducing the total number of VMT. Because of the wide range of available measures, a plan for control of automotive emissions may be tailored or designed specifically for problem areas within an AQMA, whether they are extensive or extremely localized. Proper selection from the numerous available measures can minimize the social and economic impacts that are inevitably linked to all transportation controls. It should be noted that gasoline rationing is currently considered to be infeasible and that it can be assumed that existing transportation control plans based primarily on gasoline rationing will not result in attainment of NAAQS.

Transportation control plans, initially developed to attain standards over the relatively short-term range of 2 to 5 years, have employed measures aimed at reducing both emission rate and VMT. However, for maintenance of standards over the longer range, measures that reduce the emission rates from in-use vehicles will become proportionately less effective unless new control or vehicle-power-technology breakthroughs occur, because measures such as retrofit and gaseous fuel conversions will be inapplicable to post-1975 model year vehicles. As a result, transportation control strategies needed for maintenance will have to rely heavily on measures that reduce VMT. An areawide parking management plan, a part of an overall mass transit incentive plan, can contribute to a reduction in VMT.

Inspection/maintenance (I/M) is an important control measure because not only is it capable of achieving large carbon monoxide and hydrocarbon emission reductions, but also it helps ensure that the emission reductions claimed by the Federal Motor Vehicle Control program are in fact achieved. The Clean Air Act specifically anticipates that I/M programs will be included in transportation control plans for regions having automobile-related air quality problems.

Many of the measures designed to reduce VMT have already been employed by traffic agencies for the purpose of eliminating undesirable congestion in high traffic density areas. It is important that transportation control measures have obvious accompanying benefits such as reduced congestion, time and money savings to commuters, better public transportation services, or energy savings, because experience has shown that significant restrictions of personal mobility are not likely to be accepted solely to improve air quality.

The most promising transportation control for producing lasting reductions in automobile use is probably improved mass transit. In the major urban areas where long-range transportation controls will be needed to maintain standards, only about 14 percent of work trips are now handled by mass transit. Cities that provide high quality mass transit have demonstrated that this mode of travel can attract much higher levels of ridership, particularly it auto use is comparatively difficult or expensive.

F. EMISSION CHARGES

Two types of emission charges have been suggested as control measures for air pollution. One is a charge on each point source, proportional to its emissions, that would be set at a rate related to the type of emission, the type of damages attributable to that pollutant, and the concentration of that pollutant in the ambient air of the AQMA. The other is a tax on the emitters of a pollutant, either at a flat rate for the entire State or Nation or at a rate adjusted for each AQMA.

Both types of charges are designed to internalize the external costs of pollution; that is, to place an economic burden on the individual or firm responsible for the emissions that will make the cost of pollution a part of the cost of doing business or of consuming goods. Air pollution is normally an economic burden on the general public but is free to the pollution source. Therefore, to provide an economic incentive for control, these costs must be allocated to the pollutant sources, who then will find it economical to control emissions and who will, in turn, include these costs in prices to be paid by the beneficiaries of production rather than by the general public.

Emissions charges or taxes may also be imposed as a secondary measure in addition to ordinary source control regulations. This is the most probable application for air quality maintenance.

Effluent charges on the sources of water pollution can be charged in proportion to the cost of water treatment downstream from the source. This procedure obviously does not apply to air pollution emissions. Air pollution emission charges might be set at rates that are above the cost of control and thus induce polluters to reduce emissions. Because 100 percent control is not possible for most sources of pollutant emissions, any such system of charges will tend to ration the remaining emissions to those sources for which control costs are highest or available control technology is least effective.

Taxation of pollutant emissions is yet to be tested in practice in this country. However, a tax on sulfur emissions has been proposed in the U.S. Congress. Its probable effect would be to induce controls to the level where the combined cost of the control system and the tax is least. Tax payments would continue to be made on the portion of emissions that remain after application of controls. Theoretically, an emissions tax could be implemented on an adjustable basis, with the rate being changed periodically until the desired level of total emissions is achieved and maintained.

G. TRANSFER OF EMISSIONS SOURCE LOCATION

The air quality in an AQMA is determined not only by the total emissions within its boundaries, but also by the spatial configuration of the sources. The purpose of this measure is to move selected major sources out of hot spot areas to different locations, in or out of the AQMA, where the air quality standards are less likely to be exceeded. It redistributes emissions without necessarily reducing them.

The primary application for this measure is power plants. In this case, an existing plant is not actually replaced by a new plant in a more acceptable location, but air quality maintenance considerations are integrated into the planning mechanism for the electrical utility company involved. The utility must continually plan to meet short-term and long-term power demands in its service area by the most economical combination of its available production units. Although air quality considerations could influence the daily assignment of operating units to meet the system load, they would more likely be a factor at two points in long-term planning:

- Site selection for new power plants, in areas that can accommodate these major sources plus other planned development; and
- Determination of reduced usage or shutdown of an existing unit located in an unfavorable area.

This measure is usually already employed to the maximum extent practicable in new site selection. New power plants rarely go into built-up areas; siting of new plants is much studied, with air quality impacts one of the primary concerns. With lead times for power plant construction now exceeding 10 years, effective use of this measure requires long-range projections of air quality levels throughout the AQMA.

H. INDIRECT SOURCE REVIEW

Unlike most of the other maintenance control measures, indirect source control is a required, integral part of every AQMP.

The types of new or modified sources that are to be reviewed for approval under this measure are cited in the regulation for maintenance of national standards, 40 CFR 52.22. The sources subject to review include, but are not limited to, the following:

- Highways and roads;
- Parking facilities;
- Retail, commercial, and industrial facilities;
- Recreation, amusement, sports, and entertainment facilities;

- Airports;
- Office and government buildings;
- Apartment and condominium buildings;
- Education facilities.

The above sources include most public and large commercial building projects.

The review procedure is limited, however, to developments above certain sizes, which are also stated in regulation 40 CFR 42.22 (b)(2). These size thresholds are specified in terms of daily traffic volumes for highways, annual aircraft operations for airports, and number of parking spaces for most other facilities. Indirect sources smaller than the threshold sizes are assumed to be evaluated and controlled as part of overall growth by other maintenance measures.

The indirect source review procedures apply only to the automobile-related pollutants and are primarily effective in maintaining carbon monoxide air quality standards in the local area surrounding the proposed indirect source. The intent of this review procedure is to ensure good traffic design so that motor vehicle emissions in the vicinity of the indirect source are minimized. With few exceptions, the review should not result in a limitation on the size of the facility or influence its location.

On the AQMA scale, the resultant effect of the indirect source review process on carbon monoxide concentrations is best described as peak-shaving; i.e., it acts to limit concentrations in potential "hot spots", or isolated areas of high traffic density, but probably has no measurable impact on CO emissions or ambient concentrations in most parts of the AQMA.

Emission reductions are achieved through disapproval of deficient initial development plans, by requiring that modifications be made to the internal or access traffic handling facilities to improve projected traffic flow.

I. ENVIRONMENTAL IMPACT STATEMENTS (EIS's)

Section 102(2)(C) of the National Environmental Policy Act (NEPA) of 1969 requires all Federal agencies to submit an EIS to the Council on Environmental Quality (CEQ) prior to taking major actions that may significantly affect the human environment. Furthermore, the act requires that an EIS be prepared in consultation with those Federal agencies that have juridisdiction by law or special expertise with respect to any environmental impact involved. In general, the provisions of NEPA apply to projects that are administered or funded by the Federal Government; an EIS must accompany a proposal for action through the existing agency review process.

Although NEPA does not explicitly state that a project's effect on air quality is to be discussed in an EIS, both CEQ guidelines and agency regulations for the preparation of EIS's stipulate that air quality impacts are to be considered. Probably the most significant air pollution emission sources requiring EIS's are proposed Federal or federally assisted highways and airports, and power plants. The primary consideration in an EIS air quality analysis is whether the project adversely affects attainment or maintenance of air quality standards.

The sole purpose of an EIS is to alert decision makers and the general public to the environmental risks involved in major Federal actions. If the final EIS indicates that there are adverse air quality impacts including nonconformance with a State's implementation plan, of which the AQMA is a part, associated with what is considered to be the best alternative action, decision makers must evaluate whether these adverse environmental effects outweigh the benefits of proceeding with the project. NEPA, however, does not provide veto power over the decision that is finally made.

In addition to Federal environmental legislation, 17 States and the Commonwealth of Puerto Rico have legislatively adopted or administratively promulgated policies and provisions similar to NEPA. While most of the jurisdictions make use of an EIS in one way or another, the applicability and scope of the EIS requirement varies.

J. NEW SOURCE PERFORMANCE STANDARDS

These measures encompass two distinct programs that have the common characteristic of requiring stringent controls on new sources: Federal New Source Performance Standards (NSPS), and State and local requirements for lower allowable emissions for new or modified sources than for existing ones.

Responsibility for development, implementation, and enforcement of the Federally promulgated NSPS rests with EPA. Authority for implementation and enforcement may be delegated to the States upon submission and approval by the Administrator of adequate procedures for these purposes. NSPS are applicable only to new or modified sources in specific stationary source categories proposed and promulgated by EPA. The procedure requires testing of the source after startup to determine compliance.

State regulations usually have provisions for review of new sources prior to construction and call for disapproval if the applicable emission regulations or NAAQS would be violated. A State or local regulation with more stringent emission limitations on new or modified sources would be implemented through this review procedure.

The NSPS generally provide more restrictive controls than SIP regulations for existing sources, thereby ensuring minimal impact from new sources in the specified categories. Another aspect of this measure's air quality maintenance action is the reduction in emissions that results from obsolete sources being modified or replaced by comparable new ones that are subject to the lower allowable emission rates of the NSPS. As more source categories are included under the provisions of the NSPS, this measure will increase in scope and effectiveness in reducing emissions. Upon promulgation, the emission limitations of the NSPS are mandatory on all subsequent new or modified sources. Therefore, this measure is present in all areas independent of AQMP provisions and should be considered as an integral component of all AQMP's.

Under the Federal program, NSPS are adopted according to nationwide priority, which may or may not be the same as that required for any specific AQMA. Nothing in the Federal regulations precludes the States from prescribing lower allowable emissions limitations on new sources in categories not covered by Federal NSPS. This would be considered as a maintenance measure and would permit the tailoring of a program specific to the AQMA. Should Federal NSPS be subsequently developed and promulgated, the State-developed emission limitations would continue to be applicable if they are at least as stringent as the NSPS. If the State-developed emission limitations are less stringent, the NSPS requirements would take precedence.

K. REVISION OF EXISTING SIP CONTROL MEASURES

An early step in the development of the AQMP is the determination of whether more stringent emission limitations on existing sources in the form of an SIP revision would be adequate to maintain air quality. If routine SIP revisions alone would be sufficient, an AQMP is not required. Amendment of pertinent State regulations, revision of the SIP, and demonstration that the revised control measures would result in the maintenance of air quality is sufficient to satisfy the air quality maintenance requirements.

Should more stringent controls not be feasible and/or should such an analysis indicate that these measures would not, by themselves, provide the control required to maintain NAAQS during the period 1975 through 1985, an AQMP would be required. Revision of the existing SIP emission limitations then becomes one measure among many that should be considered in the development of an appropriate maintenance strategy. The extent to which such a measure could be implemented would depend on the existing level of control and the types of emission sources present in the area.

L. PHASEOUT OR PROHIBITION OF EMISSION SOURCES

Phaseout of emission sources is a measure whereby certain emission sources are eliminated by prohibiting their incorporation into new construction or by prohibiting operation of existing sources. Unless operation is prohibited, those sources already in operation are not affected until obsolescence requires replacement, at which time they become subject to the provisions of this measure. Phaseout of existing emission sources can occur as the result of a business decision, as a result of mandatory prohibition by a specified date, as a result of the imposition of performance specifications on emission sources, or as a result of legislation prohibiting operation of specific types of equipment.

To be successful, acceptable alternative equipment or services must be available for whatever is to be phased out or prohibited. These alternatives should be cost competitive in addition to offering reduced pollutant emissions.

Two desirable applications of this control measure are the phaseout of inefficient domestic oil-fired furnaces and the prohibition of onsite incinerators. In an AQMA where greater emission reductions are needed to accommodate expected growth, an extreme application would be the prohibition of new fossil-fuel-fired space heating units in a specified area where maintenance action is required.

Phaseout measures are appropriate for forcing shifts toward desired technology or equipment when more direct or drastic action is impractical. These conditions frequently exist when large amounts of capital investment are involved or when the equipment is pervasive throughout society so that changes can only be made gradually without causing unacceptable disruption or hardship.

M. FUEL CONVERSION

This measure is defined as all processes in which one fuel is converted to another form that has a lower pollutant emission rate per Btu. Fuel switching by individual sources, the ultimate result of increased availability of cleaner fuels from fuel conversion processes, is described under another measure, Energy Conservation and Utilization. Processes in which fuels are converted directly to thermal, electrical, or kinetic energy also are not considered as fuel conversion. Some of the conversion processes currently of interest--most of which involve coal conversion--are:

- Coal gasification
- Coal liquefaction
- Coal desulfurization
- Oil desulfurization.

Additional processes may become prominent within the initial 10-year air quality maintenance planning period or thereafter.

Within the initial 10-year planning period for AQMP's, there are several critical limitations on the application of this maintenance measure. Most importantly, the technology for many of the coal conversion processes is still in the research and pilot plant stages, and design and construction lead times for available processes average 5 years. Therefore, the measure connot be implemented on a significant scale within the next 10 years. Secondly, the cost of clean fuels produced by the processes is generally not competitive with current costs of available natural fuels of comparable quality. Until the economics of fuel conversion change or fuel prices increase, conversion is not economically attractive.

From the standpoint of implementation and enforcement, planning and control agencies have no direct powers to require private energy resource companies or public utilities to build fuel conversion facilities, nor to specify the amount or type of clean fuels to be produced. Stringent regulatory requirements on emission rates or allowable fuel characteristics may promote the introduction of fuel conversion practices, but only if they are economically justifiable in comparison with the use of acceptable natural fuels or emission control systems. Even if converted fuels were produced for a metropolitan area, mechanisms would not be readily available to allocate this cleaner fuel to areas within an AQMA where it would be of most benefit for air quality maintenance. On the other hand, longer term applications of fuel conversion are almost unlimited, especially in view of the recently increased emphasis on fuels research.

Fuel conversion, as an industrial process, may have direct impact on air quality within an AQMA. Economics normally dictates that the conversion process take place at the source of coal, oil shale, or other new material. The buildup associated with the plant and the plant itself may generate emissions that could threaten NAAQS in areas where present air quality is much better than secondary standards. Some of these remote areas have been proposed as natural resource AQMA's.

N. ENERGY CONSERVATION AND UTILIZATION

Optimum use of fuel and energy resources to reduce air pollution emissions encompasses both energy conservation and the redistribution of currently available fuels to combustion sources. Conservation measures are aimed at the reduction of energy demands through more efficient use of energy; e.g., better insulation of buildings to reduce thermal losses. A reduction in energy requirements will decrease the quantity of fuels used by combusion sources, thereby reducing the emissions of pollutants to the atmosphere.

A fuels redistribution policy is not intended to reduce the total quantity of fuel used by combustion sources, but rather to reduce the pollutant emissions directly through the use of emission control devices. This can be accomplished through the use of incentives whereby those combustion sources for which control devices are readily available are encouraged to use so-called dirty fuels. Clean fuels are directed to those sources for which control devices are either not available or are economically impractical.

Specific measures that may be considered in the development of an overall energy utilization policy are listed below. This list should not be considered to be exhaustive, as additional measures may be appropriate for a specific AQMA.

Energy Conservation Measures

- Revision of building codes to reduce thermal loss
- Reduction of heating and cooling requirements
- Greater use of multiple family structures
- Energy conservation in industrial processes
- Revised scheduling of industrial activities
- Vehicle use restraints
- Fuel consumption restrictions on new vehicles.

Fuels Redistribution Measures

- Incentives to change fuel type
- Prohibition of specific fuels.

Energy utilization measures are not clearly in the domain of a single regulatory agency. Therefore, extensive intergovernmental cooperation would be required to implement an energy utilization program exclusively or primarily for air quality maintenance.

O. COMBINATION OF EMISSION SOURCES

The underlying assumption of the combination of emission sources measure is that it may be beneficial from an air pollution viewpoint to combine a large number of small, uncontrolled emission sources into one large, well regulated, and well monitored emission source. Such combinations not only result in better emission control but also simplify enforcement as well. Combination of emission sources may produce an economic advantage because of the increased efficiency that usually results from economies of scale. As a part of sound air quality management, however, it must result in a net emissions reduction of pollutants into the atmosphere.

Two applications of this measure are emphasized: district heating and use of municipal refuse as a fuel in steam-generating boilers. These applications are complementary in that the facility used to provide one service may also provide the other; e.g., a district power plant can be built that furnishes heat, hot water, and electricity to a neighborhood and at the same time uses the solid waste of that neighborhood as part of the fuel charge to generate these consumable energies. This combination of emission sources involves dissimilar types of sources (power generation emissions and solid waste disposal emissions). A more conventional combination of sources involves the replacement of a large number of similar sources by a single source of the same generic type.

District heating generally can be implemented only in new construction and therefore requires a long lead time for full impact. The heat distribution system requires high-pressure plumbing and compatibility with fixtures in the individual buildings, so retrofitting of existing neighborhoods is not feasible.

Combination of emission sources in the applications described above would be most effective for urban areas with high population densities or clustered development. This maintenance measure may also influence growth patterns in an AQMA--developments incorporated into the service areas for proposed total energy systems would probably develop more rapidly than those that are not.

P. SPECIAL OPERATING CONDITIONS

Two principal types of actions are included under this heading: supplementary control systems and procedures applicable to malfunction, startup, and shutdown operations.

Supplementary control systems are predetermined procedures whereby the rate of emissions from a source is curtailed when meteorological conditions conducive to high ground-level pollutant concentrations exist or are anticipated. A proposed revision to 40 CFR 51 would permit the selective use of supplementary control systems only where adequate constant emission reduction techniques are not available to attain and maintain NAAQS, and where permanent production curtailment, shutdown, or delay in attainment of NAAQS are the only other alternatives. The proposed regulation also requires that a source must be isolated from other emission sources to qualify for this type of control. This requirement for source isolation greatly limits the potential application of supplementary control systems in

AQMA's. Provisions for widespread short-term curtailment of sources are already included in implementation plans for emergency episode control, but these are generally designed to combat pollutant concentrations higher than the NAAQS, not to maintain short-term standards.

Specific operating procedures frequently must be followed in order to minimize pollutant emissions from certain processes during periods of startup or shutdown or when malfunction of the process or its pollution control equipment occurs. Careless operation during these periods or inadequate maintenance may result in short-term air quality standards being exceeded in the vicinity of these sources. To reduce this possibility, sources may be required to demonstrate the adoption and use of proper maintenance and operating procedures. This particular measure would probably have a negligible effect on maintenance of long-term NAAQS.

Q. STACK HEIGHT REGULATIONS

The use of tall stacks as a maintenance measure is intended to be applied in addition to, rather than in lieu of, stationary source emission regulations. It is recognized that, even though all sources may be operating in compliance with allowable emission rates, it may be necessary to effect a further reduction of ground-level concentrations of air pollutants as growth in the AQMA results in some locally high emission densities. The use of a tall stack to decrease ground-level pollutant concentrations is based on the following fact:

> Under any given set of meteorological conditions, the ground level concentrations of a gaseous pollutant emitted at a constant rate into the atmosphere will become smaller as the effective height of emission of the pollutant into the air is increased (ref. 1).

While tall stacks can be effective in the maintenance of acceptable air quality on a localized basis in an AQMA, they do distribute emissions over larger areas. If air quality maintenance is also a problem in some of these more distant areas, emissions from tall stacks add to the existing pollutant burden in these areas.

Tall stacks are sometimes divided into two categories in evaluating their effectiveness in air quality improvement--stack heights based on good engineering practice and those higher than judged to be good engineering practice. "Good engineering practice" requires that stacks be high enough to prevent the plume from being engulfed in wakes, eddies, and aerodynamic downwash associated with the facility, nearby structures, and terrain features; and high enough to prevent short-term NAAQS from being exceeded (as a result of the single source) during periods of neutral stability and high wind speeds.

Stack heights associated with good engineering practice could be ensured by specifying minimum stack heights in the emission regulations for different types and sizes of sources. Stack heights beyond those considered to be good engineering practice are not recommended as a maintenance measure in AQMA's.

R. CONTROL OF FUGITIVE DUST SOURCES

Construction activity is the most significant fugitive dust source in most AQMA's. The primary construction sources are highway, residential, commercial, and industrial construction projects. In addition, fugitive dust emissions from unpaved roads and agricultural activities indigenous to the arid and semiarid areas of the Great Plains, Far West, and Southwest can have a considerable effect on the air quality of AQMA's in these regions. Total suspended particulates is the only pollutant resulting from fugitive dust sources.

Several methods have been employed to reduce the dust emissions from construction sites, including those listed below. Expected average control efficiencies are shown in parentheses.

- Watering (50%)
- Chemical stabilization of completed cuts and fills (80%)
- Treatment of temporary access and haul roads on or adjacent to site (50%)
- Minimal exposure periods for active construction areas (50%)

While these measures have relatively low control efficiencies compared to other particulate controls, they are proven techniques that can be enforced as regulatory requirements. Rigorous control of construction activities and other fugitive dust sources provide emission reductions from a source category that is presently regulated through nuisance provisions. Hence, it can be considered as a maintenance measure.

Most of the techniques to reduce air pollution in highway construction or building construction could be implemented by additional provisions to construction specifications and building codes or by air pollution control regulations. Several agencies have passed regulations requiring permits to construct on a site. In order to obtain and keep a permit, the contractor must have an approved plan to control dust. This is an enforcement aid, because the permit can be revoked if a dust problem is observed on the site.

REFERENCES

1. National Air Pollution Control Administration. Tall Stacks, Various Atmospheric Phenomena, and Related Aspects. Publ. APTD 69-12, Arlington, Va., May 1969.